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[NOTICE.]

Wrinkle Department, American Gas Institute.

WRINKLE DEPARTMENT, AMERICAN GAS INSTITUTE,
OFFICE OF EDITOR, GAS OFFICE BUILDING,
DETROIT MICH, March 12th, 1909.

To the Members, American Gas Institute: All members of the American Gas Institute are earnestly requested to forward contributions for the Wrinkle Department as soon as possible.

Your co-operation determines the success of the Department.

F. L. CROSS, Editor.

BRIEFLY TOLD.

PERSONAL.—Credit should be given to whom it belongs, and that is what the JOURNAL wishes to give. However, last week we made a miscredit, in that we said that the Springfield (Mass.) Gas Light Company had authorized Superintendent Fowler to go on with the construction of an office building. It is true that the Springfield Company has authorized Superintendent Burritt to so do, not Superintendent Fowler, who has for quite some time been holding down the responsible dual position of Secretary and Treasurer of the Charlestown (Mass.) Gas and Electric Company. We may be excused for the slip, however, in that the history of the Springfield Company is quite like the history of Mr. Fowler, which corporation he certainly served for years and years, with zeal, fidelity and success.

ITINERANT METER TESTERS GET ANOTHER REBUFF.—The administering of the law respecting the ownership of gas meters, and that which may be done with them on the premises of a consumer, are matters that are pretty well settled in most of the States of the Union. And in each case that has proved a test one, in as far as we have knowledge (and our information covers the ground thereof pretty thoroughly), the verdict has been to uphold the contention that even the actual consumer on whose premises the meter rests, is estopped from in any manner seeking to change the same. The latest State to lay down the essence of the law in this respect is Wisconsin, in an opinion handed down by Justice E. B. Belden, of the Circuit Court, in the case of the Racine Gas Light Company *vs.* Joseph Flynn. The latter formerly held a responsible position in the service of the Racine Gas Light Company, but later on his connection with it was severed. He eventually took up the traffic of inducing patrons of the Racine Company to distrust the accuracy of the meters on their premises—Flynn, as is usual with his kind, was not particularly careful about the charges that he made respecting the Company's practice. He had succeeded in inducing several of the Company's large consumers to have their meters tested. The Company got after him right away, and a test case was brought in the suit entitled "Racine Gas Light Company *vs.* Flynn." Testimony having been properly brought before the Court, the latter, after due advisement, in effect did aver that: "Promiscuous testing of meters in the manner complained of by defendant ought not to be permitted; that the matter of methods of handling gas and of testing meters is properly one of legislative control, and the Legislature having prescribed methods and rules therefor, they should be complied with, and are exclusive, at least so far as defendant is concerned in this suit. That a divided or irresponsible control of handling gas and testing meters ought not to be permitted, that defendant may not use gas supplied by defendant, even after it has passed the meter, for the purpose of making tests such as are here complained of; that promiscuous testing of meters such as is here complained of would be likely to lead to a multipicity of suits; that plaintiff has no adequate remedy at law and that defendant is not responsible in case of adverse judgment. The plaintiff is entitled to the relief sought. Counsel for plaintiff may draw findings accordingly."

LIBRARY OF CONGRESS AUG 1 1909 SMITHSONIAN DEPOSIT.

CURRENT MENTION.—

A CORRESPONDENT in Rutland, Vt., writing under date of the 25th ult., sends the following: "According to a statement made by J. W. Redmond, of the Vermont Public Service Commission, the Bennington Gas Light Company can obtain no redress through the Commission in its controversy with those of its customers who have refused to pay their bills at the advanced rate that became effective June 1st. The Company may fix whatever rate it pleases and the village and town authorities are powerless; but a patron of the Company may appeal to the Commission. The opinion of Chairman Redmond is contained in a letter to the President of the Gas Company requesting the Commission to hold a public hearing in the case. In reply to this request the Chairman wrote: 'We have no jurisdiction to do that on your application. The only jurisdiction we have in that respect is on the complaint of one of the public—one of the patrons or would-be patrons of a public service corporation—that the rates charged by it are unreasonable and asking that we investigate the matter, and, if we find the rates charged are unreasonable, to fix reasonable ones. You have a right to fix rates in the first place, and we have no jurisdiction to meddle with the rates so fixed, except on complaint, as just explained. We have heard no complaint from any of your patrons. I might add that we have jurisdiction, of our own motion, to intervene on behalf of the public, to protect it against unreasonable rates.' The patrons of the Bennington Gas Light Company, who are refusing to pay the bills presented, are basing their refusal on a provision of the franchise to the original corporation fixing the price of gas at $1.50 per 1,000 cubic feet. The present Company, which purchased the plant and franchise, has raised the price to $1.90 per 1,000 cubic feet."

THE Peoria (Ills.) Gas and Electric Company is now a member of the Union Railway, Gas and Electric Company, which latter is a holding corporation for the interests of Messrs. E. W. Clark & Co., of Philadelphia, and Hodenpyl, Walbridge & Co., of New York. Its officers are: President, A. G. Hodenpyl; Vice-President, Clarence M. Clark; Secretary and Treasurer, Gesrge E. Hardy.

A CORRESPONDENT in Willimantic, Conn., sends the following under date of the 27th ult.: "Some days ago the executive management of the Rockville-Willimantic Lighting Company met in Willimantic. It controls the Willimantic Gas and Electric Light Company, also the Companies furnishing gas and electric currents to Rockville and Stafford. This meeting was the first one held and these officers were chosen: President, Walter H. Learned; Vice-President, H. C. Murray; Treasurer and General Manager. Alex. J. Campbell. The Company in a formal statement just published declares that it owns and operates, under perpetual franchises, the entire, gas, electric lighting and power business done and to be done in the cities of Rockville and Willimantic and the towns of Vernon and Windham, the entire electric light and power business in the towns of Stafford and Ellington, and upon completion of its new pole line will control all the electric lighting and power business in the towns of Coventry, Willington and Mansfield. The prospectus further states: "These communities have a combined population of approximately 32,000 and are showing a steady and healthy growth. The census returns show a gain of about 50 per cent. since the business was first established. It is worthy of note that the Connecticut interests owning and managing this property have had a long and successful experience in the operation of similar public utility corporations in the cities of New London, Waterbury, New Britain, Stamford, Thomaston, etc. A contract has been made which will enable the Company to secure its electricity from a water power plant (Uncas Power Company's) situated 10 miles above Norwich on a tributary of the Thames river. This will reduce the cost of electricity by over $12,000 a year. A further saving of $6,000 per year will be effected by improvements in the gas plants and by the concentration of the clerical and executive departments."

MR. D. D. SHUMWAY, Manager of the proposed Gas Company for Taylorville, Ills., has served notice on the City Council that he will not accept the franchise which the City Fathers proposed for the Company in place of the one asked for by Mr. Shumway and associates. The main difference arose over the scales of prices which, as adjusted by the Council, were on the average fully 50 per cent. under those named by the Shumway promotors in their petition to Council for a working franchise agreement.

GENERAL MANAGER ROBERT J. CHAMBERS is busily engaged with his superiors in making up a new selling schedule for the Montgomery (Ala.) Light, Water and Power Company.

THROUGH us the "Advertising Department" of the H. Mueller Manufacturing Company wishes every superintendent to write to the Company asking for a copy of its new "Tool Box Catalogue." It lists in nice order the many "practical tools" for gas, water and electric light men, that are made by the Company, and it is a certain convenience to have it nearby when one wants to order something in a hurry—or at leisure, either, for that matter. Nothing that we could say here could improve the Company's goods, for these easily command the market. Those 500 miles East of Chicago who desire the catalogue should address the New York office, which is located in 254 Canal street, New York; those West of that line should apply direct to headquarters, Decatur, Ills.

COLONEL IRA C. COPLEY has purchased a controlling interest in the Aurora (Ills.) *Daily Beacon*, but we are at a loss to know whether he is to be its Editor or Publisher; in fact, it is possible he will be both, for he certainly is big enough for the job. The Halls were the main agents heretofore in the *Beacon's* economy, and "Col." Albert L. Hall is by no means a tyro in newspaper matters. To the contrary, his "trenchant" pen has written down many things that have attracted much attention outside his domestic bailiwick. And so goes on to fame, yes, to greatness, the shrewd and smiling gentleman under whose firm, intelligent guidance the Western United Gas and Electric Company has prospered well.

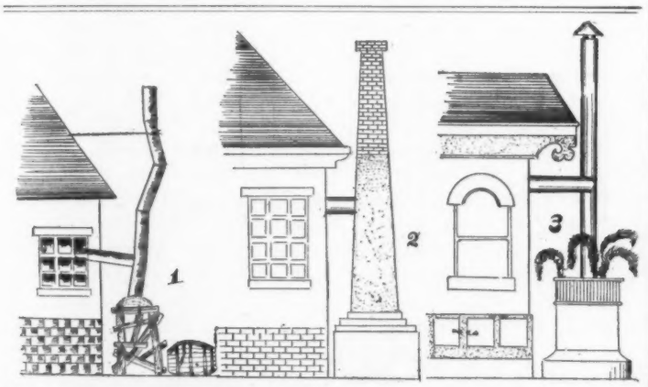
MR. EDWARD M. BASSETT, who, as all gas men in this State know, is a painstaking member of tne Public Service Commission for this District of New York, was on a voyage west last month in quest of information, and during that trip he stopped over in Minneapolis, Minn., which "thriving community" is just now engaged in a very verbose discussing of the question, "Shall the local gas company be purchased for operation on public accounts?" Naturally Commissioner Bassett's presence in beautiful Minneapolis was improved upon by the newspapers to have him interviewed over the state of affairs there existing in respect of the status of the gas company matter. The *Tribune* man managed to apply the pump with good effect, for in reply to a leading question or two our Commissioner made the following return: "I do not believe that Minneapolis can afford the the luxury of owning its own gas plant. I do not wish to say that the city would not be justified in taking over the plant at the expiration of the present lease next year, but I believe that few of our larger American cities have reached a point in their development where they can operate such works without a loss. To avoid bitterness in the dealings between a city and a gas company or other corporation, or for other reasons, it might be the right thing for a city to operate its own plant, even at a loss. People frequently spend money on things that do not bring returns to justify the expenditure, but still think they have received good value for their cash, and there is no reason why cities cannot do the same thing. A serious objection to this arrangement, aside from the loss to the city treasury, is that whenever a plant operated by a municipality produces anything for both public and individual consumption, someone is compelled to pay for the benefits that are received by others. If Minneapolis conducted a gas plant at a loss, some of the taxpayers living outside the limits of the piping system would have to help pay for the cheap gas that was being used by residents nearer the center of the city. In theory, municipal ownership, with all the public utilities conducted under the same thrifty management that the corporations employ, and all the prfits going to the consumers, is the ideal way of solving the problem, but can this thrifty management that is so essential be obtained? A large percentage of the voters in our large city have little respect for public property or public economy when compared with their own gain. I believe that this condition must be more nearly eliminated than it is at present in the larger cities of this country before municipal ownership will be practicable. By that I do not mean that in my opinion any city is foolish to attempt public ownership, as many cities are in a position to do that very thing now, but they are almost entirely in Europe. When a place has reached that stage in its development where its population is no longer transient, the success of municipal ownership becomes a possibility. A city could get capital for any sort of a plant for 3½ per cent, while investors must be given from 5 to 6 for their money, and this tremendous difference could all be turned into savings for the consumers if such a system could be carried out. As to your Gas Company's offering a reduction in its rates if the city will waive its right to purchase the plant, there is very little I can say. I am not in a position to state with any degree of accuracy what Minneapolis should pay for iis gas, as it would take a long time to become familiar with all the influences that enter into the case. For instance, where I live we are near coal mines and I have no idea how much this company has to pay for freight on its coal to this city, and there are several other conditions equally important in regulating the price of gas that I know nothing about."

Gas Heating and Exterior Architecture.

[Prepared for the JOURNAL, by "R."]

The introduction of gas heating devices in houses has resulted in the doing away of the brick chimney, which disposition of the regulation, old-time structure has prompted designers to introduce a unique style of dummy smoke stack for ornamentation purposes. The idea was gleaned from the poor man's method of extending a dilapidated sheet metal pipe through the pane of the window frame, or through the side wall of the kitchen. Fig. 1 illustrates the method often utilized for conveying the smoke from the kitchen stove of the hovel. The woodman, the common laborer of the country, the railroad-working Italian, along the lines of the tracks, may be found living in houses in which there are no regular brick chimneys. Throughout the Southern States there are plantation workers in homes of mud, stone, clay and lumber, minus the conventional chimney. Therefore, in order to procure facilities for conducting off the smoke, and for affording a draft for the fire, exterior means are adopted. The advent of the type of exterior sheet metal stove pipe, shown in the illustration, led to the designing of the more elaborate kinds. Ordinarily the poor man heaps some ashes or junk for a base for the stack, and as there are barrels and tins scattered about, the pipe is bent, rusty and disordered, and there is no attempt at making a decorative landscape scene for novelty or attractiveness. Nevertheless, the rich man got his idea from the old jumble seen in the laborer's fixing.

As long as residences were regularly constructed with brick chimneys, they was no call for unique styles, as no one thought of elaborating on the brick smoke-conducting affair, but as soon as the introduction of gas heating devices made it possible to abandon the chimney, architects were called upon to elaborate on an exterior smoke stack for country and city residences with a view of ornamental architecture. The practicability of the scheme did not count. It was simply a proposition of adorning a home. The exterior chimney, as used for outside ornamentation, is for novelty. Fig. 2 illustrates the second step in the plan. Instead of the tumble-down affair of the average poor man's cottage, a neat, tall, brick or concrete stack is made. The introduction of concrete blocks has had something to do with the application of the architectural idea. The fact that the concrete contractors are enabled to introduce various designs of blocks and figures, in sand and cement compositions, makes it possible to utilize some very well designed combinations in imitation of solid stone. There are moulded floral effects, figures, scrolls and patterns of every sort cast direct in the flasks while the blocks are in process of manufacture. There are stacks moulded with bottle glass pulverized and, in cracked condition, employed with series of figured patterns. There are blocks of the concrete moulded with hardwood figures imbedded within the same, which elaborations are set up in novel style simply for the oddness of the combination. When regular humdrum coal or wood fires were used exclusively, the brick chimney was required, but with its removal, and the use of gas ranges, the exterior imitation or dummy affair is used.



While Fig. 2 shows one of the outside stacks in plain composition, this stack does not by any means represent the typical description of plainness. Some of the dummy stacks on the contrary are far from being plain, in that examples of these are not only thoroughly ornamented from bottom to top, but are provided with a base in which flowers grow in considerable beauty. Fig. 3 shows a style used by the richer classes. Sometimes the outside chimney is employed at the hothouses of the rich, and there are seats and arches in the vicinity. Then, again, the summer cottage is decorated with an exterior chimney, even though there be no draft passages through the same, for a fire is not burning.

The introduction of the dummy stacks for attractive uses has led to experiments with ventilating apartments through such stacks. The architect first adopted the dummy stacks to please the tastes of certain persons, who wanted some sort of a sky-scraping spire to substitute the regulation chimney, which had been taken out when the gas ranges were installed; but the domestic engineers have had their wits working on the useless spires, with the result that systems of ventilating passages have been successfully adopted in connection with some of the spires. The dummy chimney idea is referred to because it illustrates one of the changes in modern architecture resulting from the adoption of gas ranges, gas fireplaces and gas heating apartment stoves, in place of the regular kinds in homes, offices and shops. It also illustrates one of the whims of the architecture of the present.

[CONTINUED FROM PAGE 332.]

PROCEEDINGS, FIFTH ANNUAL MEETING, IOWA DISTRICT GAS ASSOCIATION.

HELD AT ELLIS HOTEL, WATERLOO, IOWA, JUNE 23, 24 AND 25, 1909.

FIRST DAY, MORNING SESSION, WEDNESDAY, JUNE 23, 1909.

On motion of Mr. Chubb the reading of the minutes of the last meeting was dispensed with.

The Vice-President called for the

REPORT OF COUNCIL,

which the Secretary read as follows:

The Council of the Iowa District Gas Association met in Des Moines, February 18. The following were present: Messrs. Austin Burt, E. D. Clary, Thomas Crawford, Jansen Haines and G. I. Vincent. In the absence of the President and the First Vice-President, Mr. Austin Burt assumed the Chair.

A Committee on the preparation of a "Uniform System of Accounts" for very small gas companies was announced as follows: Messss. G. I. Vincent, Geo. H. Waring and George S. Forest.

The Secretary reported that he had communicated with the American Gas Institute and with the Chairman of the Technical Committee of the Institute, and had been advised that the Institute approved of the preparation of a Uniform System of Accounts by the Iowa District Gas Association. The Committee was instructed to proceed with this work and report to the Association meeting, at Waterloo, in June.

The Council decided to recommend to the Association the appointment of standing committees, as suggested by Mr. Haines in his presidential address at the Omaha meeting in 1908: 1. Gas Works Construction. 2. Gas Manufacture. 3. Gas Distribution. 4. New Business. It was decided that the suggested Committee on Accounting was covered for the present by the Committee on a Uniform System of Accounts.

A Finance Committee was appointed as follows: Messrs. E. D. Clary, Chairman; E. G. Pratt and George H. Waring.

It was decided to hold the next annual meeting at Waterloo, Ia., June 23, 24 and 25.

The Committee on Arrangements was appointed as follows: Messrs. Maynard, Chairman; Burt and Roper.

It was decided to have an exhibit of appliances, and for the Secretary to communicate with the manufacturers who are represented in the Association, advising them to this effect.

Mr. R. H. Lawlor was appointed Chairman of the Committee on Exhibits, with power to increase his Committee to three.

The Secretary reported that he had made a donation of $25 to the Practical Class fund of the American Gas Institute and received acknowledgment. Also reported that he had communicated with the Secretary of the Practical Class in regard to the acceptance of the indorsement of the active members of the Iowa District Gas Association of applications for membership in the Practical Class, and that the Secretary had advised that the matter would be laid before the Trustees.

It was decided to limit the papers to broad, general subjects, and to bring out by discussion as many phases of the subject as possible.

It was decided to hold an open session for discussion on the evening of the first day's meeting, on June 23; the meeting to be under the

direction of Mr. Jansen Haines, of Des Moines, and all arrangements to be left in the hands of the Committee on Arrangements.

Papers were assigned as follows:

"Construction and Operation of a Gas Works in a Town of Five Thousand Inhabitants or Less," by Mr. Thos. Crawford, Clinton, Ia. Discussion by Messrs. Waring, Carson, Stratton, Forest, Green, Bertke, Lawlor (Fremont), Kidder.

"The Gas Meter: Its Construction, Operation, Sources and Causes of Error, and Its Reliability as a Measuring Device," by R. H. Lawlor, Waterloo, Ia. Discussion by Messrs. Porter, Asendorf, Hutchinson, Clary, Borden.

"Mutual Interests of the Gas Company and the Community," by Geo. McLean, Dubuque, Ia. Discussion by Messrs. Maynard, Haines, Kellogg and Porter.

"Organizing and Pursuing New business Campaigns," by Mr. E. H. Martin, Omaha, Neb. Discussion by Messrs. Fair, Grey, Green, Adams.

"High Candle Power Competition," by Mr. Elmer Crady, Sioux City, Ia. Discussion by Messrs. Kellum, Borden, Carson, Fair.

"Operating a Water Gas Machine," by Mr. W. J. Bertke, Sioux City, Ia. Discussion by Messrs. Adams, Brice, Clary, Chubb, Maple, Myers.

The following topics were accepted for discussion during the session:

"Keeping Ice Out of Steel Holder Tanks and Cups."
"Methods of Disposal of Waste Water from a Gas Works."
"Progress of Tar Market During the Year."

The Council met at the Hotel Ellis, Waterloo, Ia., June 22, 1009, at 8 P.M.

Minutes of previous meeting read and approved.

The following applications for membership were approved:

Active.

Addy, W. B., Gen. Mgr., Citizens Gas and Electric Company, Waterloo, Ia.
Blackwell, H. C., Gen. Supt., Peoples Light Company, Davenport, Ia.
Cunningham, W. A., Mgr., Peoples Light Company, Anamosa, Ia.
Innes, J. A., Sec. and Mgr., Citizens Light, Heat and Power Company, Eagle Grove, Ia.
Myers, E. B., Asst. Supt., Omaha (Neb.) Gas Company.

Associate.

Ashton, A. J., Central Appliance Co., Chicago, Ills.
Bowers, Wm. J., Foreman, Fort Dodge (Ia.) Light and Power Co.
Cressler, G. H., Sec'y and Asst. Engr., Kerr-Murray Mfg. Co,, Ft. Wayne, Ind.
Clausen, W. F., Rep., Michigan Stove Co., Bloomington, Ills.
Chisholm, C. T., Trav. Rep., General Gas Light Co., Kalamazoo, Mich.
Curfman, F. G., Trav. Rep., Improved Equipment Co., New York City.
Dungan, J. G., Salesman, Detroit Stove Works, Emmetsburg, Ia.
Dunkle, C. C., Trav. Rep., Welsbach Co., 68 Wabash Ave., Chicago, Ill.
Forbes, J. W., Salesman, Rathbone-Sard Co., Waterloo, Ia.
Goodale, J. C., Jr., Salesman, Kalamazoo (Mich.) Stove Co.
Mason, A., Welsbach Co., Gloucester, N. J.
Parkhill, R. F., Rep., Brand Stove Co., Milwaukee, Wis.
Shacklette, R., Sec'y, Lloyd Construction Co., Detroit, Mich.
Seeman, S. L., Sec'y, Kinglyte Mfg. Co., Des Moines, Ia.
Tenney, D. C., American Construction Co., Newton, Ia.

The Council appointed the following Nominating Committee: Messrs. Kellogg, Chairman; Roper and Maynard.

The Council decided to recommend to the Association an annual donation of $25 to the Practical Class of the American Gas Institute.

The resignation of the following members was accepted:
O. H. Hinds, Ass't Manager, LeMars (Ia.) Gas Company.
H. E. Morton, Manager, Watertown (S. D.) Gas Co.

Six members were dropped for non-payment of dues.

On motion of Mr. Clabaugh the action of the Council in the matters just read was ordered approved.

Donation to the Practical Class Fund.

On motion of Mr. Clabaugh the Secretary was instructed to forward an annual donation of $25 to the Practical Class of the American Gas Institute.

Election of New Members.

On motion of Mr. Haines the Secretary was instructed to cast the ballot of the Association for the unanimous election of the members whose names were proposed to the Association. [The Secretary cast the ballot as directed and reported accordingly.]

Chairman Waring called for the

Report of the Secretary and Treasurer,

which was read by Mr. Vincent, as follows:

According to instructions at the last annual meeting, a donation of $25 was sent to the Practical Class of the American Gas Institute.

Your Secretary wrote to the Secretary of the Institute asking if the Association could purchase the digests of all technical articles which are prepared by the Institute. The idea was to secure prices and lay the matter before the Council. Mr. Beadle, the Secretary of the Institute, replied, offering the digests free to the Iowa Association and placing the Association on the regular subscription list without cost. Your Secretary considers this a very graceful act on the part of the Institute. These digests cover all the technical articles published in all the journals published in this and foreign countries bearing on our industry and also the electrical industry. They are now on file in the Secretary's office and are at the service of all the members. It is no exaggeration to say that practically the "last word" on any subject of interest to our fraternity is to be found in the digests. Of course they are always right up to date.

Personal letters were written to all of the unaffiliated gas companies in the three States asking that they send a representative to this meeting. This was followed by another letter at a subsequent date. The returns were not particularly satisfactory. Your Secretary sincerely believes that no man operating a gas plant in our territory can afford to stay out of this Association, nor would he want to if he knew the good to be derived. Invitations to this meeting have been sent to the officers and, through them, the members of all the gas associations.

During the year 20 applications for membership were received, 2 resignations and 6 members dropped by action of Council. The membership of the Association now consists of 64 active, 53 associate and 1 honorary member.

Receipts—Total	$663.74
Expenditures—Total	350.52
Cash on hand as per check book	313.22

Respectfully submitted,
G. I. Vincent, Secretary and Treasurer.

Mr. Vincent said: In connection with this report I have prepared lists of the standard gas companies in all three States, giving those that are represented and those that are not. At the Council meeting last night it was suggested that I read these at the meeting with the idea that, if any member knew the representatives of the unaffiliated companies, they could tell them what a good thing it was and get them in. The idea, of course, was not to increase the membership to increase our income—we don't need the money—but because we want these men themselves to get into the Association, as there is so much good to be derived for them. The list of unaffiliated companies is:

Iowa.—Centerville, Eldora, Fort Madison, Knoxville, Mt. Pleasant, Nevada, Perry, Shenandoah and Vinton.

Nebraska.—Beatrice, Central City, Kearney, Nebraska City, Norfolk, York, Carson City, Reno, Tonopah and Blair.

South Dakota.—Deadwood, Dell Rapids, DeSmet, Mitchell, Rapid City, Watertown and Yankton.

In Iowa two of these are very new companies. In South Dakota only 3 out of 10 standard companies are represented. In Nebraska, 9 out of 19.

In connection with the letters I sent to the officers of the various Associations, I received some very interesting material from Mr. Ewing, Secretary of the Michigan Gas Association, inclosing circulars of their proposed meeting on the boat on the Lake trip. No doubt, most of you have seen them, but I brought some circulars here at Mr. Ewing's request, which are at the service of the members.

The Vice-President—Gentlemen, you have heard the report of the Secretary and Treasurer. What is your pleasure?

Mr. E. G. Pratt—I presume special efforts have been made, and I would like to inquire what these are as to having the representatives of these different companies in the three States mentioned by the Secretary become members of this Association. It seems to me that

while perhaps the individual representatives of these companies which are not now affiliated may not be able to afford to pay their expenses to these meetings, it was nevertheless a very poor company that could not afford to have its representatives identified with this Association. If it is in order, I would like to move that a committee of three, consisting of one member from each State, be appointed to exert extraordinary efforts towards getting into this Association the representatives of the companies not now represented. [Seconded by Mr. Haines.]

The Secretary—Replying to Mr. Pratt's query, let me say the only effort I could make was by correspondence. As said in my report, I have sent out letters, follow-up letters and second follow-up letters. These were all personal letter, not circulars, all dictated separately, and the last letter carried a stamped, addressed envelope to me. Of all those letters sent out I had only two replies, which came in the stamped and addressed envelopes. It occurred to me, as Mr. Pratt suggested, if somebody a little nearer to the ground than I am, particularly in Nebraska and South Dakota, could reach these men in some more personal way than I was able to do it and put the matter before them verbally instead of by correspondence, no doubt they would all come in. I think if representatives from the smaller towns would come to one of these meetings they would want to come to all of them.

Mr. Clabaugh—I think it would be well if the Secretary sent to all of these unaffiliated companies the remarks that the Mayor said this morning. They will at once see they have not the courtesy absolutely necessary for the advancement of their business, and there will be more than two replies to Mr. Vincent's letters in the future, because I think we listened to something this morning we all have been trying very hard to carry out for a number of years in our business lines. But, as the Mayor said, and as has been shown here, there are a number of gas men to-day who, not only being not courteous to men in their line of business, necessarily would not be to their patrons. I think this good lesson we should put before them and I believe next year we will have the majority of them with us. [Motion put and carried.]

The Vice-President called for the

REPORT OF FINANCE COMMITTEE.

Mr. E. G. Pratt—I beg to report for the Finance Committee that we have examined the books and accounts of the Secretary-Treasurer and found the same correct.

The Vice-President—I understand some committees were to be appointed that were recommended by the Council. I will ask the Secretary to read the committees that were to have been appointed that have not been.

The Secretary—It is found in the report of the first Council meeting. Mr. Haines in his Presidential address last year recommended the appointment of certain standing committees, and at the next meeting of the Council they recommended to the Association the appointment of the following standing committees: 1. Gas Works Construction. 2. Gas Manufacture. 3. Gas Distribution. 4. New Business. The action now to be taken is whether the President shall be instructed to appoint these committees.

Mr. Haines—I move that, in the absence of the President, the Vice-President be instructed to make these appointments. No doubt, if Mr. Averill were here, he would be glad to make these appointments, but as he is detained I think we should not postpone action on this any longer, for it is an essential matter that we have standing committees that can keep up the interest in these several subjects and collect data for them to bring before the Association meetings at the proper time. There is a vast amount of information that, if collected at one source, sifted down and gotten into such shape that a definite specific report can be made to this Association, will be of great benefit to us on each one of these subjects. A great deal of this has been collected by the Secretary. It means a vast amount of work that I think should be distributed among other people. Two heads are better than one. We cannot afford to leave all this matter for the Secretary to collect and report to the meeting. Let us have these committees appointed, get them in action, collecting data and information on these different subjects; then, when they make a report at the next Association meeting, we will have the benefit of their information without unnecessary repetition, and avoid too verbose and lengthy discussions of subjects that might be presented in a very terse manner. I move that the Chair be instructed to appoint these committees at this session. [Seconded, put and carried.]

The Vice-President called for the

REPORT OF THE COMMITTEE ON A UNIFORM SYSTEM OF ACCOUNTS FOR VERY SMALL GAS COMPANIES,

which the Secretary read as follows:

DES MOINES, IA., June 17, 1909.

To the Iowa District Gas Association—Gentlemen: Your Committee appointed to prepare a uniform system of accounts for very small gas companies begs to report as follows:

On entering upon this work the idea of your Committee was to prepare a system of accounts similar to that of the Junior system of the American Gas Light Association, only very much simplified. Upon further consideration of the matter, however, it was decided that such a system would be of doubtful utility.

The proposed system is to be used largely by very small gas companies, in which practically all work will be done by one man, and it seemed only fair to assume that in these cases the one man would know very little about bookkeeping, in that as his duties would require him to about take up all his time in the operation of his plant there would be no chance for him to learn. Your Committee, therefore, decided that such a system, to be useful, must begin at the beginning, and prescribe in detail the exact method of not only keeping the main accounts but doing all the work, which involves the receipt or expenditure of any funds or any work that requires permanent record, and to offer ruled forms for all purposes as well as the general books This, of course, greatly increases the work of your Committee, but if agreeable to the Association it will proceed along the lines described.

Your Committee has had considerable correspondence with Mr. R. B. Brown, Chairman of the Technical Committee of the American Gas Institute, and is pleased to report that this Committee fully approves of the line of work as suggested. The Institute would like to have our completed report to present to the Institute meeting in October. If so instructed your Committee will endeavor to prepare a report, submit it to all members of this Association for approval and criticism, rearrange and submit it to the Technical Committee of the Institute in time for action before the October meeting of the Institute.

This does not necessarily mean that the report would come to the Committee with the approval of this Association, but your Committee feels that the need for this system of accounts is very urgent and that everything should be done to facilitate getting it into the proper form for use.

Your Committee regrets that it was unable to finish the work by this meeting. Respectfully submitted,

G. I. VINCENT, Chairman,
GEO. H. WARING,
GEO. S. FOREST,
} Committee.

The Vice President—You have heard the report of the Committee. What is your pleasure? [On motion, the report was adopted and the Committee was ordered continued.]

REPORT AS TO AFFILIATION WITH THE GAS INSTITUTE.

The Vice-President—The next order of business is the question of our affiliation with the American Gas Institute. It would be in order for the present representative of the Iowa District Gas Association, Mr. Jansen Haines, to give us a written report, if he has one—if not, a verbal report would answer the purpose.

Mr. Haines—I have not a written report. I attended one meeting of the Board of Directors of the American Gas Institute in which the question of this affiliation was taken up and discussed. Only one other affiliated representative was there, from Wisconsin. At that time a great many of the details of this affiliation were discussed, but no definite action taken. It appears some difficulties are involved in this matter of affiliation and that some of the smaller associations, like our own, are not thoroughly in accord with the methods of policy proposed by the Institute, and a good many of those matters will be thoroughly threshed out and discussed at the next meeting of the Directors of the Institute. There has been quite a lot of correspondence in regard to this matter between the Directors and the Secretary of the Institute and the affiliated Associations and their representatives; and these matters will probably come up then, when efforts will be made to try to settle them by a more definite form of agreement as to what is to be stopped and what is to be carried on by the affiliated Associations and the Institute. Therefore, I have nothing more definite to report at the present time than this. I will say, however, that good progress is being made along that line. I think the Association will benefit very largely after the plans have been more fully worked out and there is more thorough harmony and accord

between these Associations and the Institute, which will be developed by that plan.

Mr. Clabaugh—In consideration of what Mr. Haines has just told us, that this work is not yet finished, that it is only begun and under progress, I think it is very important to this Association that the member who is now representing this Association as a Director in the Institute should continue another year. I, therefore, move that the term of Mr. Haines, as affiliated representative of the Iowa District Gas Association, be continued another year. I think it is most important that this should be done at the present time. [Seconded, put and carried.]

NEXT PLACE OF MEETING.

The Vice-President—The next order of business has to do with deciding upon the place of next meeting. I understand the Council appoints or decides the place of next meeting, but that the pleasure of the Association is desired in regard thereto, and the Council has largely acted upon the wishes of the body, although the Council has authority in this matter. Are there any remarks?

The Secretary—We have voluminous correspondence in regard to this matter which, with your permission, I will read.

The Secretary then read the following letters:

SIOUX CITY, IA., June 22, 1909.

Iowa District Gas Association, Waterloo, Ia.—Gentlemen: On behalf of the Sioux City Gas and Electric Company, I wish to extend to you a cordial invitation to hold your next annual meeting in Sioux City. Our city is well supplied with hotel accommodations, and I believe we can entertain your Association in a satisfactory manner. Trusting you will give this favorable consideration, I am, very truly yours. L. L. KELLOGG, Manager.

SIOUX CITY, IA., June 21, 1909.

The Iowa District Gas Association, Waterloo, Ia.—Gentlemen: As a matter of selecting a meeting place for your next annual convention will no doubt come before your meeting at Waterleo, permit me, in behalf of this organization (Board of Trade), and the citizens of Sioux City in general, to extend to your organization a cordial invitation to come to Sioux City for your next annual meeting.

Yours very truly, E. O. BURGESS, President.

SIOUX CITY, IA., June 22, 1909.

Iowa District Gas Association, Waterloo, Ia.—Gentlemen: On behalf of the citizens of Sioux City, I wish to extend to you a cordial invitation to hold your next annual meeting at Sioux City. The hotel accommodations are ample, and I am sure nothing will be left undone by our citizens to make your stay a pleasant one. The officers and employees of the Sioux City Gas and Electric Company of this city have bren very accommodating to our citizens and have aided in different charitable institutions, so that our city, for local reasons, feels very kind toward your Association. Trusting you will give us favorable consideration, I am, very truly yours,

W. G. SEARS, Mayor.

Mr. L. L. Kellogg—I consider the remark of our Mayor worthy of the effort in getting up those letters, so we have accomplished something if we don't get the convention; but this invitation is sincerely extended and we hope you will accept it. We are not going to make a strenuous fight for it, because if we are shown that it will be better for the Association to hold the meeting somewhere else we will accede to it and go somewhere else, but unless we are shown we will ask our friends to support Sioux City.

Mr. Crawford—When I came here I proposed to try to get the meeting for Clinton. Having heard read the list of companies that are not members of this Association, I think it would be better to have the meeting in Sioux City, because a lot of those companies are out towards the west. For my part I am willing to pass it up this year and go to Sioux City.

The Vice-President—You have heard the remarks of the representatives of Sioux City and Clinton. Anything further?

On motion of Mr. Pratt it was voted that the next meeting be held in Sioux City.

The Vice-President—Next in order of business is the appointment of a Committee on Final Resolutions. As it is the duty of the Chair to appoint this committee, I will appoint Messrs. Clabaugh, Crawford and Roper. Next we have the

REPORT OF THE NOMINATING COMMITTEE.

The report was read by Mr. Roper, as follows:

Your Committee wishes to report the following named gentlemen as officers of this Association for the ensuing year:

President.—Geo. H. Waring.
First Vice-President.—Austin Burt.
Second Vice-President.—Geo. W. Clabaugh.
Secretary and Treasurer—G. I. Vincent.
Members of Council (One year).—H. G. Pratt, Thos. Crawford, F. A. Kidder.
(Two Year Term.)—C. W. Fair, H. C. Blackwell, B. C. Adams.

GEO. D. ROPER,
H. B. MAYNARD,
L. L. KELLOGG,
} Committee.

ELECTION OF OFFICERS.

Mr. Maynard—Mr. President and members: I think you all have implicit confidence in Col. Roper and in Mr. Kellogg, and I have unbounded regard for the membership of the Committee and as a token of our approval of these appointments I wish to say that they are all made without any undue or illegal solicitation on the part of the members. I wish to move that the Secretary be instructed to cast the unanimous vote of this Association for the persons designated by the Nominating Committee. [Seconded, put and carried.]

The Secretary—Mr. President, I hereby cast the ballot of our Association for the election of the candidates as read by the Nominating Committee. We will now have a speech from Mr. Waring.

SOME RESPONSES.

Mr. Geo. H. Waring—My attention has been called to the fact that the election has not been declared yet. I now declare these gentlemen elected. Gentlemen, I wish to thank you for this token of your esteem. I assure you I will do my best to act as your President next year. It is rather a surprise to me that I had to preside this morning.

Mr. Burt was then called upon by the members.

Mr. Burt—Mr. President, Gentlemen of the Association: I wish I could make a speech. I hoped another member of the Association would be selected in my place, inasmuch as there are members of the Association who perhaps are better fitted for this work. I assure you, though, that I will do the best I can to further your interests.

Mr. Clabaugh was here called upon.

Mr. Clabaugh—Mr. Chairman, Gentlemen: As a long-time, prospective President, unless a change is made, I wish to thank you very kindly for the honor bestowed. You can rest assured that if I do become President of this Association I shall give it my undivided attention, with all of the ability that I may possess, to lead it forward and increase the membership, so that each and every man will take an active part and feel that he is the man of the Association. The only way, to my mind, in which we can succeed, is to have every man feel that he is at the wheel. Then I am sure we will be guided in the straight and forward path, though not necessarily a narrow one. [Applause.]

The Vice-President—To one here this election must be quite a shock and surprise. I think we would like to hear from Mr. Vincent. [Laughter.]

Mr. G. I. Vincent—Gentlemen, I will be pleased to insert in the proceedings the like speech to that of last year and the y ear before.

The Vice-President—There is only one member of the Council present that is new to such position. I think we should hear from him—Mr. F. A. Kidder, of Red Oak.

Mr. Kidder—Mr. President and members: This is certainly a little new to me. I believe you have more confidence in me that I have in myself; but I assure you that I will do the best I can. I thank you. [Applause.]

The Vice-President—I don't believe either Mr. Blackwell or Mr. Adams is here. They were elected new members.

Mr. Pratt—I don't know what action is usually taken upon reports here, but in order to keep the record straight, I suggest that no action has been taken upon the reports of the Finance Committee or of the Secretary and Treasurer. If it be in order I move that the reports be received and placed on file. [Seconded and carried.]

The President—We will take up as first topic for general discussion the "Keeping Ice Out of Steel Holder Tanks and Cups." Mr. Bertke, will you speak to this subject?

Mr. Bertke—Our only method of keeping ice out of holder cups is to use a siphon that is especially made and adapted for this purpose.

There is a small steel orifice which can be varied, I think, from about $\frac{1}{8}$ to $\frac{3}{4}$ inch, through which the water is taken out of the bottom of the cup and is forced out of the siphon at the top; the siphons are placed in cups so that the water in them has a circulating motion; that is, it travels around the holder. The holders in the plants with which I have been connected always were equipped in similar style. We have found it very satisfactory and have had no trouble whatever in keeping the ice out of the holder cups. We have had trouble in the respect that we did use steam hose to connect the siphon with our steam supply main, and having tried the different grades of steam hose, we found that along towards spring the inside coating hardens, falls off and plugs the siphon. Of course, then, the first cold snap will freeze and so obstruct it. Last year we supplied our holders with flexible copper hose and found that had eliminated the trouble of the plugging of the siphons with rubber. It is very satisfactory. The cost of the copper tubing is about three times as much as rubber hose. I believe the general impression among the gas works men is that it pays and will last at least three times as long as the steam hose.

Mr. E. G. Pratt—I don't know that I can say very much upon this question. Several years ago I had some experience in keeping water in holder tanks and cups free from ice by the use of a small greenhouse heater, a sort of circulating water heater. The water came back from the holder tank to the heater and was heated aud returned to the tank or to the cups. That is a very successful way of keeping holders free from ice, and it is a very inexpensive method of returning the heated water, less expensive, I think, than the use of steam from the ordinary steam boiler about gas works.

The Vice-President—I understand some of the members not present are prepared to discuss this topic.

(To be Continued.)

Preparation of Purifying Material and the Purification of Gas.

[Prepared by Mr. Clark F. Farmer, for the Southwestern Electrical and Gas Association.]

In preparing a paper to be read before this Association I have, as far as I could, given you the practical side of the subject, and have left out all technical and chemical formula, with which I have no doubt you are all familiar.

One of the most important operations in the manufacture of gas is to properly purify it of all tar, heavy oils and ammonia, which are removed in the scrubbers and condensers, and of the sulphur compounds, which in chemical terms are sulphuretted hydrogen (H_2S) and bisulphide of carbon (CS_2), and of carbonic acid (CO_2); but in some cases it is not deemed economical to remove this last compound. These sulphur compounds are removed in the purifying boxes. It is very important to thoroughly clean the gas of the tar, ammonia and similar impurities before it reaches the purifying boxes and comes in contact with the purifying material, as the tar soon coats the oxide or other purifying material, thus destroying its purifying qualities by not allowing the sulphur compounds to come in proper contact for chemical action with the purifying material. The tar and other impurities are generally removed by the scrubbers, both wet and dry, and condensers, tar extractors, etc., and by passing the gas through a shavings scrubber just before it reaches the purifying boxes. The purifying boxes are generally in twos, threes, fours, etc. There should never be less than two, and each should be of such depth that at no time will there be less than 4 or 5 feet of active oxide for the gas to pass through, so as to properly clean it of the sulphur compounds.

In practice it has been found best to pass the gas as slowly as possible through the boxes. By so doing you get cleaner gas, and as it increases the life of the oxide you will not have to change the purifiers so often. Gas that has been hurried through the purifiers will show foul, when, if the same boxes are used and the gas passed slowly through them, it will be perfectly clean when tested by the sugar of lead test. The purifying capacity of boxes is usually rated at 1,440 feet per 24 hours for each square foot of purifying space. Experiments show that to increase the depth of the purifying material increases its capacity, but not in direct proportion. The most economical depth seems to be 4 or 5 feet of active oxide in each purifying box. When two purifiers are used, the foul gas goes to No. 1 first, and out of No. 1 into No. 2. When No. 1 shows foul at the outlet it will be necessary to revivify the oxide in No. 1, and as No. 2 has already taken up considerable sulphur compound it cannot all be considered active oxide. For this reason purifiers should be made deep where only two are used, so that at no time will there be less than 4 or 5 feet of oxide for the gas to pass through, and the box that has been cut off to be cleaned should be placed again in service as quickly as possible. Where more than two purifiers are used, and each contains 4 feet of oxide, you have at all times 8 feet or more of oxide, which insures a large margin of safety.

The purifying boxes should be so arranged that the foul gas passes through the oldest box in the service—that is, the box that will have to be emptied next, and through the others in rotation, always having the gas pass through the clean box last. This is accomplished by the center seal in old style purifiers and by gate valves in the new ones.

Oxide can be revivified without emptying the boxes, by blowing or sucking air through it after the gas has been shut off and an opening made in the box to admit the air. While this method is practiced in many cases, it is not to be recommended. The foul oxide heats very rapidly, and if not watched very closely it will catch fire by chemical action, char the grates and ruin the oxide. The safest and best way is to empty the purifier of the foul oxide and refill it with clean oxide. By this method the foul oxide will have a chance to revivify and be ready to go into the next box. The life of the purifying material can be lengthened and made to do more work by admitting 1½ or 2 per cent. of free air with the gas before it reaches the purifiers. This amount of air has no effect on the candle power of the gas as far as can be determined.

The best practical method, in the absence of the proper apparatus, for testing the oxide to ascertain if it is doing its work, is the sugar of lead test, of which you all know. If gas is passing through the purifiers and is not being properly cleaned, the paper which you have dampened with the lead solution will, if held over the test cocks of the purifying boxes, show a dark stain; the fouler the gas the darker the stain. It is always better to revivify the oxide in the first box as soon as the gas shows foul at the outlet of said box, as it increases its life and prevents it from becoming hard and caking in the purifier, as it will do if allowed to stay in service too long. Dirty gas (by that I mean gas that has not been freed from the sulphur compounds) causes endless trouble to the consumer. On arc lamps a coating of tar and carbon forms which is very hard to remove and will return in a very short time. And if heaters are used there will be an odor of the burned gases, of sulphur, and a choking sensation to persons in the room. I have known cases in which all the nickel-plating in the room turned black and no amount of rubbing by hand would restore it to its original color, so it had to be sent to the factory to be renickeled. Still another source of trouble from dirty gas is the stoppage of house risers by a deposit resembling iron rust, and this is also very injurious to meters.

I have known gas that was clean when leaving the purifiers to be very foul after leaving the storage holder, caused by tar being in the holder, the clean gas picking up the sulphur compound from the tar. So, to get good service both for light and fuel, it is very necessary to have clean gas, free from the sulphur compounds, which can be eliminated by purifiers of proper depth and capacity, by not hurrying the operation and by thoroughly scrubbing and cleaning the gas before it reaches the purifiers.

Purifying Material.—In the early days of the gas industry lime was extensively used to purify gas, and is still used in one box at some plants where the coals and oils are high in sulphur; but, owing to its cost and the difficulty of disposing of the foul lime, its use has been gradually discontinued for more modern and economical purifying material, such as iron oxide, iron sponge, bog ore or similar materials. Of all the purifying materials now used iron oxide is more generally used on account of its greater purifying capacity and lower cost. It is easy to obtain and can be mixed at each plant where it is used without extra labor, unless a large quantity is wanted, and it can be used over and over again until it has taken up about 60 per cent. of sulphur by weight.

I have used the following recipe for making oxide for the last eight years, and it has given entire satisfaction as to its cost, purifying qualities and life of material: To 20 lbs. of clean cast iron borings (the finer the better) use one bushel of soft pine shavings (or sawdust for shallow boxes); spread the shavings in a thin layer and sprinkle the borings evenly over them, wetting the mass as the layers are spread. Repeat these layers until the desired quantity is prepared. (Wetting with brine will hasten the operation.) Then, with shovels turn the mass until it is thoroughly mixed; then make a pile of it and let it stand for 10 or 12 hours, when the oxide should be very hot; then turn it into another pile, wetting it down as before. Care

should be taken not to get it too wet. This operation will have to be repeated every 12 hours for four or five days; then once in 24 hours should be sufficient, as the oxide now heats more slowly. When it does not heat after being turned it should be spread in a thin layer, about 12 or 14 inches deep, and allowed to stand until wanted for the purifiers. New oxide will not purify as much gas when it is first used as it will after it has been worked a couple of times, and should be watched very closely when in use. When it shows foul in the box it should be taken out and heaped in a pile, which should begin to heat at once, and in 10 or 12 hours' time should be hot enough to burn one's hand if thrust into it. It should then be spread in layers 18 inches deep, left for 24 hours, then turned in layers 12 inches deep, and can then be left until wanted again.

In making oxide, care should be taken not to leave any free iron in it, and do not let it come in contact with any woodwork, either in making or revivifying it, as it is liable to fire the oxide, char the wood and ruin the oxide. Care should be taken to keep tar and oil from it, as both destroy its usefulness.

In charging the purifiers with the oxide it should be sprinkled with water to dampen it, but should not be made too wet—just wet enough to stick together when squeezed in the hand - as too much wetting would cause it to cake and become hard in the boxes, making it very difficult to remove again when foul.

The Gas Engine in Central Station Work.

[Prepared by Mr. Wm. F. Flint, for the Canadian Electrical Association.]

The gas engine is very valuable for the economic use of fuel in the production of power. The object of this paper is to make clear some of its possibilities, particularly when operated in connection with the bituminous coal gas producer, and to state facts which will enable each central station manager to see its application to his local conditions.

To get the best results from the gas engine its economies at different loads must be known. The following data is based on the performances of the particular make of engines (Westinghouse) with which the writer is most familiar. Referring to the left-hand portion of Fig. 1: Curves *A* and *A'* are to be read to the scales at the bottom

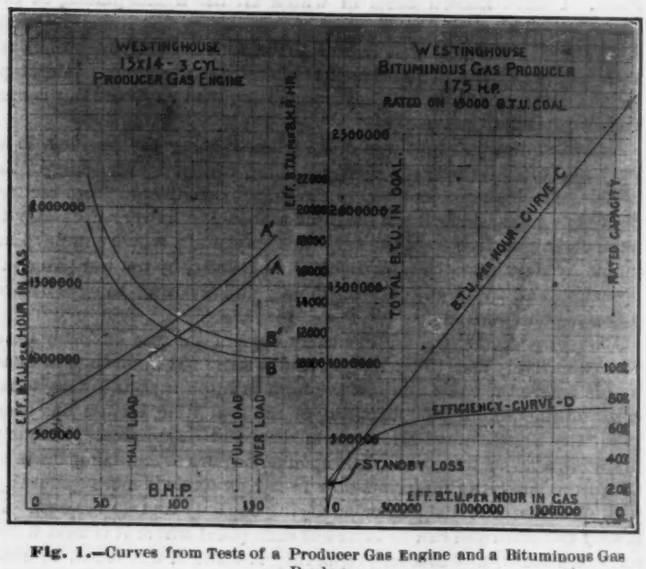


Fig. 1.—Curves from Tests of a Producer Gas Engine and a Bituminous Gas Producer.

and left and curves *B* and *B'* to the scales at the bottom and right. Curves *A'* and *B'* are the average test performances of a number of 140 B.H.P. producer gas engines operating on producer gas. Curves *A'* and *B'* may be regarded as poor performances for this size of engine and ones which would call for correction by the operator. Curve *B'* may also be read as the probable good performance of a 10-horse power 2-cylinder engine by disregarding the brake horse power scale and reading the full and half load economies for the large engine as applicable to the corresponding loads on the small engine. Larger engines may be expected to show even better economies at corresponding fractions of their rating than indicated by curve *A*, but the betterment is not very great and may be disregarded in this paper. One of the peculiarities of gas engines is that small ones show almost equally as good economy as large ones.

For the purpose of making the figures which follow correspond with results which may be relied on in commercial operation, they will be based on curves *A'* and *B'*. The lesson to be drawn from these curves is that the sizes and numbers of gas engines installed should be such as to permit shutting down any unit or units and transferring their load to others when it falls below one-half the rating. An engine which uses 11,400 effective British thermal units per brake horse power hour on full load may be expected to use 35 per cent. more on half load and to fall off in economy very fast below half load.

Bituminous Fuel.—At the right of Fig. 1 are shown the results which may be expected from a double fire zone bituminous producer. These are based on tests with different grades of coal extending over a year's time, each test representing from 3 to 15 days' continuous operation. The standby loss shown on this sheet is much greater than necessary, as was proved by afterward more carefully adjusting the draft. The producer was capable of delivering 1,900,000 effective British thermal units in gas per hour continuously on Pittsburgh run-of-mine coal averaging 13,300 B.T.U. per pound as fired, and of delivering considerably greater quantities of gas for short periods of 2 hours.

When poorer grades of fuel, such as lignite, were used, they could not be fired at greater rates per hour, and hence the output of the producer was reduced in proportion to the heat value of the coal. There was some falling off in the heat value of the gas per cubic foot as the output decreased, but this was not serious so long as the load did not fall below one-quarter the rated output of the producer. The producer referred to above consists of an upper and a lower section with an annular water cooled offtake casting between them. The fire in the upper section drives off the volatiles and breaks up the resulting vapors by virtue of operating on the down draft principle. The fire in the lower section consumes the coke descending from the upper section and allows the ashes to free themselves from practically all fuel. The lower fire thus rests on a bed of ashes extending down into a water sealed basin. Ashes may be readily raked out from time to time without disturbing the operation of the producer. The relative rate of combustion of these two fires is controlled by a valve in each supply pipe. This air is drawn in first through an air space in the top cover of the producer, where it is warmed, and then through the steam space of the water cooler offtake casting, where it takes automatically the amount of moisture required to control the temperature of the fuel bed and to properly enrich the gas.

The gas leaving the producer is practically free from tar, but contains some lampblack and dust, which are washed out in the static washer. The gas then enters a large elevated drum, from which it is drawn off by a motor driven rotary blower which supplies gas at a constant pressure through a regulating valve to the line leading to the engines. This regulating valve is operated by a small holder type regulator and by-passes any gas not required by the engines back into the elevated drum, where it mixes with the gas delivered by the producer and serves to even up the richness of the output. The producer thus operates under suction and the charging door may be freely opened to put in new coal or to inspect the fire without danger of gas escaping or disturbance of the quality produced. There is usually a momentary enrichment of the gas when the fire is poked and this is made harmless by being mixed in the mixing tank with gas of more average richness. Poking is required at intervals of from 1 to 2 hours to keep the fire bed uniform. Referring again to the right hand portion of Fig. 1 it will be seen that the producer efficiency remains fairly constant at about 70 per cent. over a wide range of loads, and that its standby loss is a very small per cent. of its capacity. The power required to operate the exhauster is not more than about 2 per cent. of the output of the producer.

There are several other successful bituminous producers on the market, but the one described above embodies valuable features not found in them.

Anthracite Fuel.—There are many successful ant hracite producers on the market and they have the same characteristics of small standby losses and high efficiency over a wide range of load. In fact, tests made on a non bituminous suction producer of about the same size as the bituminous producer referred to above, gave efficiencies ranging from 73 per cent. at one-half to 79 per cent. at full rate output. The producer used was of the up-draft suction type. It may be operated by the suction of the engine if desired, but where two or more engines are to take gas from one or more producers it is advisable to instal a

centrifugal fan to deliver the gas under pressure, for the engines are easier started and will develop about 5 per cent. more power, which more than compensates for the power required by the fan. The steam required is made in the top plate of the producer, which, like the one just described, has a water sealed bottom and requires no gas holder.

In the pressure type anthracite producer, the air is drawn into tne base by a steam jet, which affords sufficient pressure to overcome the resistance of the fuel bed and deliver gas to the line. This is a good arrangement where live steam is available, but if a small boiler has to be fired for the producer alone, its efficiency is usually so poor that its coal consumption is a material factor.

Other Fuels.—Where available at satisfactory price natural gas is the ideal fuel. The engine cylinders are usually smaller for the same power than for producer gas, but the British thermal unit consumption will be substantially as shown in Fig. 1, curves *B* and *B'*.

In this connection Fig. 2 will be of interest, for it shows graphically the constituents of the principal fuel gases. As a rule those which contain a large proportion of nitrogen and carbon dioxide (CO_2) require larger engine cylinders, and will stand higher compression than those containing little or no incombustible gas, but they give fully as high or higher efficiency in the engine.

The gas engine is so well known that it need not be described in detail at this point.

A Typical Example.—The use of the curves may be best brought out by assuming a central station load curve and figuring out the desirable engine sizes and method of operation. The load condition will be assumed to be that shown in the accompanying tables, which are

Lightest Load Day in Year.

Time.	Load. K.W.	Units in Service.	Load.	Average B.H.P.	Efficiency B.T.U. per Hour in Gas.	Total B.T.U. per Hour. Coal.	Pounds 13,0 0 B.T.U. Coal.
11 P.M.	66						
12 A.M.	55						
1 "	42						
2 "	37						
3 "	35						
4 "	35						
5 "	35				100-horse power engine at 55.5 per cent. load, same efficiency as 140-h.p. engine, 78 B.H.P., which by curve B', Fig. 1, requires 14,600 efficiency B.T.U. per B.H.P. hr. 55.5 B. H. P. + 14,600 = 810,000 effic'y B. T. U. per hour.	810,000 efficiency B.T.U. in gas per hr. by Curve C., Fig. 1. 1,230,000 total B.T.U. pr. hour in coal. 200,000 total B.T.U. per hour stand-by. ——— 1,430,000 total B.T.U.	1,430,000 ——— = 110 pounds. 13,000 coal per hour. 110 pounds. ——— = 3.06 pounds. 36 kw. coal per kw. hour. 110 pounds × 19 hours = 2,090 pounds.
6 "	36	One 100-horse power gas engine and 66-k.w. gen.		Assume generator efficiency 87 per cent. at 55 per cent. load: 36 k.w. ——— = 55.5 .746 × .87 B.H.P.			
7 "	37						
8 "	33	One 175-horse power producer making gas.	Aver., 36 k.w. Total, 685 k.w.h.				
9 "	33						
10 "	29	One 175-horse power producer at stand-by.					
11 "	29						
12 M.	29	For a period of 19 hours.					
1 P.M.	29						
2 "	29						
3 "	26						
4 "	24						
5 "	26						
6 "	55						
6 "	55	One 190-h.p. engine and 130-kw. generator.		Generator efficiency 89 pr.ct. at 68 pr. ct. load: 88.2 kw. ——— = 134 .746 × .89 B.H.P.	190-h.p. engine, 70 pr. ct. load. like 140-h. p. engine at 98 B.H.P. 134 B. H. P. × 13,000 ef. B.T.U. = 1,740,000 eff. B.T.U. per hour.	1,740,000 in gas means 2,410.000 in coal: 200,000 stand-by. ——— 2,610,000 total B.T.U.	2,610,000 ——— = 201 pounds. 13,000 201 ——— = 2.28 pounds. 88.2 201 pounds × 5 hours = 1.005 pounds. Total, 3,095 pounds. 2.75 pounds per kw. hr.
7 "	95						
8 "	112	One 175-h. p. producer making gas.	Aver., 88.2 kw. Total, 441 kw.h.				
9 "	104						
10 "	97	One 175-h.p. producer at stand-by.					
11 "	66	For a period of 5 hours.					

Heaviest Load Day in Year.

Time.	Load K.W.	Units in Service.	Load.	Average B.H.P.	Efficiency B.T.U. per Hour in Gas.	Total B.T.U. per Hour in Coal.	Pounds of 13,000 B.T.U. Coal.
12 A.M.	66						
1 "	52	One 100-horse power engine and 66-kw. generator.	Aver., 51.5 kw. Total, kw. hour 412.	51.5 kw. ——— = 77 .746 × .90 B.H.P.	77 per cent. of engine rating equivalent to 108 B.H.P. on 140 engine, which by curve B', Fig. 1, requires 12,400 eff. B.T.U 77 B.H.P. × 12,400 = 955,000 eff. B.T.U.	955,000 eff. B.T.U. in gas by curve C, Fig. 1, requires 1,410,000 total B.T.U. in coal 200,000 total B.T.U. stand-by. ——— 1,610,000 total B.T.U.	1,610,000 ——— = 124 pounds. 13,000 per hour. 124 pounds. ——— = 2.41 pounds. 51.5 kw. per kw. hour. 124 pounds × 8 hours = 992 pounds.
2 "	44						
3 "	40						
4 "	40	One 175-horse power producer making gas.					
5 "	40						
6 "	46	One 175-horse power producer at stand-by.					
7 "	60						
8 "	75	For period of 8 hours.					
8 "	75				67 per cent. of engine rating equivalent to 94 B.H.P. on 140-h. p. engine, which by curve B' requires 13,200 eff. B.T.U. 134 B.H.P. × 13,200 = 1,770,000.	1,770,000 eff. B.T.U. in gas per hour by curve C, Fig. 1, requires 2,450,000 total B.T.U. in coal, 200,000 total B.T.U. stand-by. ——— 2,650,000 total B.T.U.	2,650,000 ——— = 204 pounds. 13,000 per hour 204 pounds. ——— = 2.32 pounds. 88 kw. per kw. hour. 204 pounds × 8 hours = 1,632 pounds.
9 "	79	Two 100-horse power engines and two 66-kw. generators.					
10 "	72						
11 "	68						
12 M.	77	One 175-horse power producer making gas.	Aver., 88 kw. Total, kw. hour, 704.	88 kw. ——— = 134 .746 × .88 B.H.P.			
1 P.M.	88						
2 "	104	One 175-horse power producer at stand-by.					
3 "	107						
4 "	121	For period of 8 hours.					
4 "	121				86 per cent. of engine rating equivalent to 121 B.H.P. on 140-h. p. engine, which by curve B', Fig. 1, requires 11,900 eff. B.T.U. 250 B.H.P. × 11,900 = 3,000,000.	1,500,000 eff. B.T.U. from each producer means 2,100,000 total B.T.U. in coal to each, or 4,200,000 total B.T.U. in coal to the two.	4,200,000 ——— = 323 pounds. 13,000 per hour. 323 pounds. ——— = 1.91 pounds. 169 kw. per kw. hour. 323 pounds × 8 hours = 2,584 pounds. Total, 5,208 pounds. 2.11 pounds per kw. hr.
5 "	165	One 100-horse power engine and 66-kw. generator.					
6 "	191						
7 "	200	One 190-horse power engine and 130-kw. generator.	Aver., 169-kw. Total, kw. hour, 1,352. Grand total, 2,468 kw. hour.	169 kw. ——— = 250 .746 × .91 B.H.P.			
8 "	224						
9 "	213						
10 "	187	Two 175 horse power producers making gas.					
11 "	154						
12 A.M.	66	For period of 8 hours.					

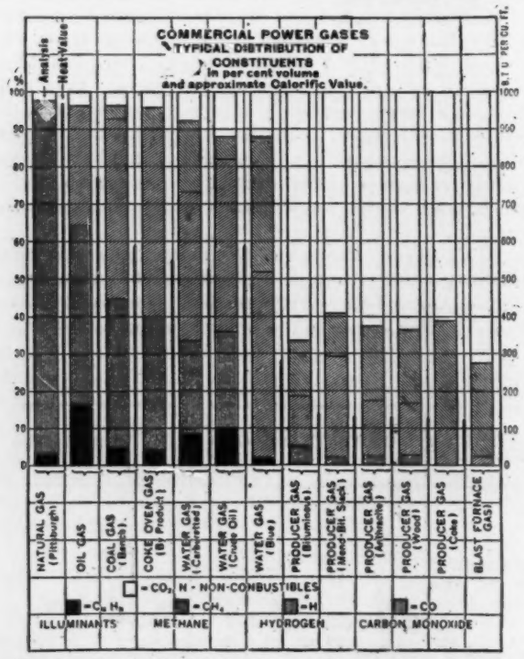


Fig. 2.—Chart of the Relative Value of Commercial power Gases.

based on figures for 1906, obtained from the Bradford Electric Light and Power Company, Bradford, Pa., through the courtesy of the General Manager, J. H. Rose.

This plant is located in the natural gas region and adopted gas engines about 10 years ago, and found they required about one-third as much gas as the boilers did which supplied the steam engines.

The street arc light load is not included in these figures, for it is a substantially constant load, and is taken care of by 2 125-horse power gas engines driving four belted, 50-light Thomson-Houston arc machines. In a more modern installation the arc lights would probably be operated from the alternating current bus bars and form a part of the general station load.

These extremes of load might well be handled by a plant consisting of three 175-horse power bituminous coal gas producers, two 190-horse power engines driving 130-kw. alternators and two 100-horse power driving 66-kw. alternators. One of the larger engines and one producer would be held as a spare to guarantee continuity of service from the start, and would stand ready to accommodate an increase in business. The first two columns of the tables show the loads for all hours of the day and night. The third column shows the units which should be running. The fourth column gives the average kilowatt load and the kilowatt hours. The fifth column gives the brake horse power load calculated from the average kilowatt load by assuming suitable generator efficiencies. The remaining colums are figured with the aid of curves *B'* and *C*, Fig. 1, and give the total consumption and the coal per kilowatt hour for the several load conditions. The results in this instance are 2.75-pound per kilowatt hour for the day showing the lightest load and 2.11-pound per kilowatt hour for the day showing the heaviest loads. It should be easily possible to run such a plant on an agerage of 2.5-pound per kilowatt hour throughout the year.

It seems safe to assume that ordinarily the waste heat from the producers and engines would be more than enough to warm the power house even in the coldest weather, and this could be readily supplemented when necessary by burning the producer gas in suitable stoves, much as natural gas is burned in the Pittsburgh territory.

Storage Battery Auxiliaries.—Under some conditions, probably rather uncommon in central station work, the storage battery is a desirable auxiliary to gas engines. For instance, a central station may have an opportunity to improve its load factor, particularly during the day, by selling 500-volt direct current to a small street railroad company. The extreme fluctuations of this class of load would make it ordinarily most undesirable, for enough engines would have to be operated to meet the maximum demand and the average load would be a very small fraction of their rating. The storage battery is eminently fitted to even up the demand on the power house, particularly when equipped with a storage battery regulator which can be set to draw a constant current from the power supply and use it either to build up its own charge or to supplement its output to the line. Such a battery works at rapidly alternating and very high rates of discharge and charge. While its watt efficiency is probably not over 75 per cent., or, including the transformer, rotary converter and booster, not over $0.75 \times 0.97 \times 0.92 \times 0.95 = 0.63$, it has the valuable property of putting a steady average load on all the other apparatus except its booster, back to the engine in the power house, and thus allow a comparatively small engine running at or near to full load to carry a load having peaks 2, 4 or even 6 times the mean. The first cost of such a battery and its auxiliaries will often be but a fraction of the cost of the engine, generator and other apparatus which would be required to carry the peak loads without the battery and the power losses with the battery will be less than without it by virtue of running the engine, generators, etc., at efficient loads.

Again, a small central station may have a very small all-day load, which necessitates keeping an engineer on duty whose services for one shift might be otherwise dispensed with. In this instance, particularly if it is a direct current load, a battery may be installed to carry it and the losses in the battery may easily be less than those involved in running an underloaded engine, particularly when the charging of the battery is made to bring up the load on the engine to one corresponding to good efficiency.

A Standard of Daylight Illumination of Interiors.

By P. J. Waldram, F.S.I., in *Illuminating Engineer.*

Whilst the tendency of modern conditions of life and work is to multiply the number and complexity of indoor operations, and so tax to an increasing degree the eyesight of all classes of the community, the increased size of buildings in towns and suburbs enhances the difficulties of the problem by diminishing the area of sky available for daylight illumination.

The subject is of such importance that it is not too much to say that the proper lighting of schools, libraries, offices, factories, shops and warehouses ought to be subject to public control as being a matter vital to the present and future interests of the race. It is certainly quite as important as many of the matters now controlled by rigid local by-laws.

One of the first results of the recently instituted systematic medical examination of schools had been to draw attention to defects of lighting; and rightly so, for if any illumination ought to be the subject of supervision by experts, it should be that under which the delicate eyes of children are first subjected to the continued strain of reading and writing.

There are many evidences that the popular as well as expert interest is being aroused in questions of proper illumination—both daylight and artificial. In the cure and prevention of disease, the value of ample daylight is now widely recognized; whilst the whole trend of modern domestic architecture bears testimony to the general desire that windows should be designed to light rooms rather than to decorate exteriors.

There are good reasons for the fact that the ideas of the average person on the subject—important as it is—should be extremely vague, and only to be expressed by indefinite generalities; but it is strange that architects and illumination experts, to whom the public would naturally look for guidance, should be very little better informed, and that no such thing as a general standard of daylight illumination should exist. Out of a hundred men capable of designing the proper artificial illumination of an interior it would be difficult to find one who could say what average illumination would be given by any particular size, shape or area of a window, or what difference would be made by any given design of obstruction to the visible horizon—by the use of various color in the interior decoration—or by any other of the determining factors.

Although interior daylight illumination is capable of very easy measurement and standardization, it is by no means easy to estimate by casual observation, because the human eye has many unrecognized limitations and unconscious prejudices, frequently the obvious result of having been trained through countless ages to the necessities of outdoor life. It will note and measure, for instance, the small ranges of illunination between dawn and sunrise and between sunset and dark—but it is indifferent to, and even unconscious of, the very much wider ranges between sunrise and sunset.

Prehistoric man doubtless found it very important to note the proper times to wake up and start work or hunting and to seek a

shelter for the night, but the pupils of his eyes were not asked to notify him of the fact that they were—by gradually opening and closing—reducing to a more or less common level the visual sensations received from large variations in illumination during the day.

This insensibility of the eyes to large variations of diffused daylight is seldom recognized, because of the eyes' extreme sensibility in the presence of artificial illumination—to the use of which it is still comparatively unaccustomed. When one finds that under artificial light the reading of small print is, say, impossible at 0.1 candle feet, difficult at 0.2, easy at 1.5 to 4, difficult at 6 and impossible at 8, it is hard to realize that under diffused daylight scarcely any difference can be detected on printed paper between 5 and 500 candle feet. This fact alone would be sufficient to make the eye quite unreliable as a measuring instrument for comparing the relative daylight illumination of different rooms at different times and seasons, but there are many other misleading prejudices to be taken into account; as, for instance, with regard to the reflecting value of different colors in wall papers and the relative value of light from different angles of altitude. The obvious value of an unobscured horizon to a prehistoric dwelling or shelter gives us to-day the strong but often incorrect impression that if plenty of clear sky can be seen from the windows of a room, then that room is and must of necessity be well lit, irrespective of whether the window be broad and low or high and narrow. It often needs ocular demonstration to convince an average committee of the superior relative value of high angle light before they will believe that to lower the ceiling and window heads of a schoolroom by a foot may decrease the daylight illumination by 50 per cent. The immensely superior lighting capacity of high windows or lantern lights is almost unknown—nine people out of ten looking at the dull stone interior walls of the Strand Law Courts would consider them as an example of very poor lighting—whereas really the unusually high windows illuminate the desks and tables where small print has to be read to a degree far superior to that of many apparently well-lit offices. The writer recently had occasion to measure the daylight illumination of two offices, A and B, in Westminster. Both were lit from the same aspect and they had approximately the same proportion of window space to floor area. Office A, on the first floor, had a high ceiling and high windows, but its horizon was so badly obscured by surrounding buildings that the sky could only be seen from a standing position when the observer was close to the window. Office B, on a high top floor, had low windows, but an absolutely unobstructed horizon. The two rooms were measured within a few minutes of each other on a windless day, with a uniform gray sky, and were found to enjoy equal illumination at table height. A similar instance occurred last year. An engineer who required the best possible light for his draughtsmen moved his offices from a lower floor, facing a dirty but distant flank wall, to rooms on a higher floor, with lower window heads, but a splendid view over the Embankment Gardens. The new situation was in the summer a matter of congratulation from his clients and the envy of his professional friends, but the effect of the lower ceiling and window heads was very quickly felt by his draughtsmen on autumn and winter afternoons, and his bills for artificial light were substantially increased.

That a top skylight gives to a room quite an hour's more working light—night and morning—than would be afforded by the same area of glass in ordinary vertical windows is a fact which can be observed in many a public library having similar rooms lit by each method, but very few people appreciate it.

Many factory roofs are built with one steep and one flat pitch (see Fig. 1). The steeper sides are glazed and face north to secure an

equable light. If the flatter pitches were turned to the north a much greater quantity of light would be given by a smaller amount of glazing, and it would be of an even more equable character because a workman facing south would not then stand in his own light, as he does at present in any factory lit with a steep north light.

In previous articles I have described how the daylight illumination of an interior can be measured in spite of its necessarily fluctuating character by taking advantage of the fact that it is always a constant proportion of the outside light at all times and seasons, except when the room is lit by the direct rays of the sun or directly reflected rays. The necessary measurements as described therein are extremely simple, and being merely comparisons they do not require an exactly calibrated or standardized photometer, but merely one with a lamp which can be relied upon to remain constant for the few minutes required for the double reading, inside and outside. They are also very quickly taken, some 50 or 60 observations at the different important points in an ordinary elementary school, with say ten or a dozen class rooms, can be made and recorded by one operator in about an hour without assistance.

When the average daily range of sky brightness for each month in the year is known, and a proportion of that brightness received by any part of an interior has been measured, it is easy to ascertain the average number of hours per day during which any given minimum illumination will be enjoyed by that part of the interior. It is also found that window efficiency and the effect of any given obstruction to it can be readily measured on scale models, and by this means any given loss of light can be expressed as the additional number of hours of artificial lighting necessary for any given purpose. Also in the case of new buildings in crowded situations the prospective illumination of rooms lit by light wells, long corridors, etc., can be tested in a model before building is commenced or the plans decided upon. Of course, owing to the large range of outside illumination, even a badly lit room will enjoy more or less sufficient light over some period of every ordinary day; and every room, however ample the window space, requires artificial light between sunset and sunrise. But it is also obvious that the average proportion of daylight received by a room may be so low that its period of good lighting is unduly restricted.

A rough working rule would be that all parts of a room should have a minimum illumination of 1 candle foot between sunrise and sunset throughout the year, except on foggy or unusually dark days, but this would be too much to expect in some cases, and possibly insufficient in others. For instance, an office enjoying a proportion of 0.001 of the outside illumination in the center of the room might be regarded as reasonably well lit; but the desk of an elementary school receiving only that proportion would be generally considered as an insufficiently illuminated position for a child to work in, in spite of the fact that during ordinary school hours it would only drop below 1 candle foot on foggy or unusually dark winter days, and at all other times it would be receiving a much higher illumination.

Although it is difficult to lay down hard and fast rules, it is obvious that the more completely existing buildings—good, bad and indifferent—can be measured and recorded, the more closely it would be possible to define the minimum limits of reasonably good daylight illumination for different classes of interiors.

The following particulars of the proportion of unrestricted outside illumination enjoyed by a few well-known buildings are only, of course, an example of what might be done if the subject were systematically taken in hand. The author would venture to suggest that if the investigation were taken up by a few illuminating engineers, standards of reasonable daylight illumination could readily be fixed for schools, libraries, hospitals, offices, workshops, factories, law courts and all other classes of interiors.

The measurement of the daylight illumination of different buildings is also extremely interesting and instructive, and very quickly discloses to the investigator the strange prejudices by which the eye and the mind are frequently deceived.

Proportion of Unrestricted Outside Illumination Received by Interiors of Buildings.

New suburban elementary schools—	
Children's desks	0.0025 to 0.008
New urban technical school—	
Class rooms, ground floor, average	0.001
Upper floors	0.002 to 0.004
Ordinary offices, center of rooms, average	0.001
British Museum, reading room	0.007
" " entrance hall	0.0017
Patent Office Library—	
Center of reading room	0.005
Reading alcoves and galleries	0.0007 to 0.008
Royal Courts of Justice—	
Middle of central hall	0.0012
Courts—Judges' seats, " counsel, " solicitors, " jury and witnesses	0.0007 to 0.0022
House of Commons—	
Clerk's table	0.0008
Speaker's chair	0.0009

Behind chair	0.0002
Members' seats	0.0003 to 0.0007
House of Lords —	
Woolsack	0.0006
Members' seats	0.0004 to 0.0006
Commons lobby	0.001
Lords lobby	0.0004
Central hall	0.0015
Committee rooms (center)	0.004 to 0.005
Westminster Hall (center)	0.0012
Charing Cross Station, booking hall	0.0001 to 0.0003
Surveyors' Institution, center of library	0.0015

A Modern Programme for Modern Mathematics.

[Abstracted from an address by Dr. JAMES PIERPONT, Professor of Mathematics, Yale University, at the Commencement Exercises, Worcester Polytechnic Institute, June 10, 1909.]

I now come to the subject proper of my paper. Your esteemed President embarrassed me not a little by asking me to deliver the Commencement address this year. I appreciate greatly the honor of this graceful compliment; as a dutiful alumnus I felt I ought to accept. But for more than twenty years I have led the secluded life of a scholar. I cannot give the graduating class weighty advice, matured by long experience as a leader in public service or as a director of large enterprises or even as a humble engineer. My activities as an engineer are confined to running a motor car, and if my repair bills are any index of proficiency in this direction I fear what I have to tell you on engineering is of little value.

The only subject I really know much about is mathematics, and of it you surely have had your fill. It certainly would be straining your courtesy to ask you to listen while I told you of some of the grand advances which mathematics has made within the last hundred years. I suppose some of you fancy that mathematics has stopped growing long ago. Geometry, we all know, goes back to the Greeks; Descartes published his new geometrical method in 1636; the calculus was invented by Newton and Leibnitz and had been brought to a considerable degree of perfection at the death of Euler, one of its great masters, in 1783. If you will look over the mathematics you have studied till now you will find that but little, very little, of it is of later origin than that date. Now, as a mathematician, that grieves me. In physics, in chemistry, in all the other sciences, you have the very latest results and processes taught you. Why should it be different in mathematics? Is it because the results obtained are of little value? I think not. Is it because they are too difficult to understand? Again I must demur. Is it because too little time is devoted to this part of the curriculum? Quite the contrary. What, then, is the reason? I have long meditated over this question and have come to the conclusion that it is to be found in our method of teaching the subject. I therefore have to propose to you—

A Modern Programme for Modern Mathematics.—Fortunately, I shall not have to weary you with a detailed or technical discussion. It is so simple that a few words suffice to explain it; yet it is so revolutionary that I know it will excite the liveliest opposition. It breaks away from traditional methods, sanctified by twenty-five centuries of use, because the inadequacy of these methods to meet the present needs of progressive engineers and scientists grows every day more apparent. My programme, then, is this: *Let us stop teaching mathematics from the standpoint of logic; let us teach it as the natural sciences are taught.*

To make my point clear I will contrast our ways of teaching mathematics and a natural science—as physics. The latter is taught in a three-fold way, by descriptive lectures aided by experiments during the lectures, by laboratory work of the students and by mathematical reasoning. In the lecture the student is told that such and such facts are so, in the laboratory he verifies some of them, by the aid of mathematics he draws conclusions. In all this one characteristic feature is to be noted: Only what is easy or does not take too much time is demonstrated by experiments or by mathematics. To convince one's self of this let him recall how great is the labor and how long is the time required to verify by actual experiment the fundamental laws or determine the fundamental constants in the various branches of physics. Weeks, or even months, are often required. Or again, let him recall the intricate mathematical reasoning so often encountered when we wish to conduct an investigation in physics by the aid of mathematics alone. These facts are well illustrated by comparing such standard works as Wüllner on the one hand and Maxwell and Helmholtz on the other. It seems right, then, to grant that we teach physics, except to the most advanced student, in this easy and, so it appears to me, appropriate and successful way.

Let us turn now to mathematics. What a difference at once strikes our eye as we look over our text-books of algebra, geometry, trigonometry and the calculus. Hypnotized by the relentless rigor of Euclid, who wrote, as we know, for men, and not for boys, we find these books bristling with demonstrations which are beyond the real understanding of the student. We find author and teacher driving into the head of our unfortunate youth by practice and precept that each formula, each theorem, each method, must be rigorously established before it is used. So Euclid taught; so generations of mathematicians have taught; so blindly, and without venturing to question why, we teach.

To my mind it is a blessing that mathematics has grown so enormously of late years and is now so extensively used in other sciences that some change in our teaching is imperative. We must equip the futute scientist and engineer with the more important results of modern mathematics. To begin with, there is the theory of functions of a complex variable, which dominates so much of modern analysis. When I was a student here, more than a score of years ago, the so-called imaginary numbers—and these form the basis of this theory—were barely mentioned. As one of the editors of the then newly founded "W. P. I." it was my duty to furnish a supply of scientific matter for each number, and in the enthusiasm which belongs to youth, I prepared with great pains a paper giving some of the elementary applications of these strange numbers to analysis. The board did not share my opinion of its value as "copy" and turned it gently down. Since then times have changed. What was then a novelty is to-day the common property of all advanced students. In fact, without an elementary knowledge of the theory of functions, one is shut out of a good share of higher mathematics.

Another fundamental subject is differential equations. Everyone knows the mere elements, but beyond this are fields of vast extent, of ever growing importance in the application of mathematics to the sciences. Next we must take into account that our stock of functions is being enlarged. We have the *Gamma* and the relative *Beta* functions, the functions of Legendre, Laplace and Bessel, and the elliptic functions, all of which are currently used in applied mathematics.

Then in geometry it is no longer just or wise to restrict our students' vision to the primitive methods of Euclid, Descartes and Euler. Why should he not begin his career with a modern equipment in this respect? If so, he must become familiar with the projective geometry inaugurated by Poncelet, Steiner and Plücker, and the differential geometry of Monge and Gauss. These are, perhaps, the main branches, but others, such as the calculus of variations, the theory of probabilities, and vector analysis, would surely require some notice.

But, how. you ask, is it possible to crowd all this into a course of mathematics already overloaded. It is *not* possible, with present methods. If you retain these, our graduates leave their Alma Mater with a stock of mathematics, modern, perhaps, when Franklin was drawing lightning from the skies with his kite, but unquickened by any of the wonderful methods of these later days.

Is this right, is this in accordance with the progressive spirit which pervades all the rest of our instruction? Surely not. Why not give up these old methods and teach mathematics just as the natural sciences are taught—in particular, as physics is taught? Because we *can* base all mathematics on a few axioms and deduce all its propositions in an unbroken chain of logical reasoning, are we therefore *bound* to do this? Is that the way we teach physics or chemistry? Let us imitate the liberal spirit of these sciences. Let us stop trying to develop the logical faculties of our afflicted students; that will come in due time, just as it does in other branches of science. Rather let us try to teach mathematics with the sole end in view of imparting a comprehensive knowledge of its main results and a power to use them intelligently and efficiently when applied to other sciences, and the practical problems of their profession.

But, many will exclaim, how is it possible for the student to have any comprehension of his subject if demonstrations are to be left out? In the first place I would reply that all are not to be omitted. To my mind, as a mathematician, a given demonstration is useful to the student just so far (and no farther) as he is able to master its underlying principles and *apply* it to his problems. What part of the demonstrations which students are forced to study fulfil this test? A surprisingly small part, I assure you. In the programme I am urging to-day, such demonstrations would be replaced by explaining

nature of the results and making them look plausible. Moreover, I should not insist on giving even the easy demonstrations. Certain types could be selected, and the theorems established by similar methods could be given the student without proof. In this way two important ends are gained. First, the student is not compelled to flounder through proofs which lie beyond his stage of development and which awake in so many a distaste, if not a positive dislike for the subject. Secondly, the time so gained can be spent in making him acquainted with such important modern branches as I have already mentioned.

To lessen the force of your objections to my radical programme, let me also urge that one may use successfully and intelligently large numbers of results without any demonstration, or with the slightest. This is an everyday fact in the natural sciences, as I have already noted. It is also true to an extent in elementary mathematics which will, perhaps, startle you. None of you hesitate to use the rules of arithmetic, but how many of you have ever stopped to prove them. I doubt if one person in a million, excepting the professional mathematician, has ever seen a real demonstration of these, such as we force our students to master in geometry.

Let me note another fact generally ignored, and that is that a new school has grown up, thanks to the efforts of Gauss, Cauchy, Weierstrass and others, which has taught us that many of the demonstrations found in our text-books are totally lacking in rigor; in short, that they are demonstrations which demonstrate nothing unless it be the author's ignorance of what constitutes a proof in the modern sense.

This, gentlemen, is my programme. I do not expect that it has won your instant assent; I only hope that it may lead you to think and to observe. We read that boys learned their Latin in the days of Roger Ascham from a grammar written in Latin itself. No doubt the schoolmasters of that day were convinced that this was the only fit way. Our present way of teaching mathematics seems to me quite as antiquated and absurd. I long to see the day when a more rational plan is adopted, one which permits our students to come in contact with the living, vigorous mathematics of to-day. May the names of the great masters of the last century, Gauss and Able, Steiner and Möbius, Cauchy, Weterstrass and Riemann, Sophus Lie and Cayley, not to mention those still living, as Poincaré and Klein, be as familiar to them as are the names of Faraday and Maxwell, Helmholtz and Lord Kelvin, to the students of physics.

It is well worth while to break away from the paralyzing clutch of an outlived past and allow our youth to enjoy as a rightful heritage the splendid treasures accumulated by the mathematicians of the glorious century just passed.

Standards of Electric Service in the State of Wisconsin.[1]

The provisions of the Public Utilities Law relating to standards of service for public utilities operating in Wisconsin read as follows:

"1. The commission shall ascertain and fix adequate and serviceable standards for the measurement of quality, pressure, initial voltage or other conditions pertaining to the supply of the product or service rendered by any public utility and prescribe reasonable regulations for examination and testing of such products or service and for the measurement thereof.

"2. It shall establish reasonable rules, regulations, specifications and standards to secure the accuracy of all meters and appliances for measurements, and every public utility is required to carry into effect all orders issued by the commission relative thereto."

With a view to performing the duties imposed upon the commission by the above laws, the experts of the engineering staff undertook comprehensive laboratory and field investigations. These investigations took the form of a general study of operating conditions, including a study of meter accuracy, variations in pressure, interruptions of service, lamp renewals, gas and electric lighting. In this work the commission had the co-operation of the United States Bureau of Standards and the committee of standards of the American Gas Institute in fixing standards of service tests.

Determinations of the accuracy of gas and electric meters, of the variations in gas and electric pressure, as well as the calorimetric tests of gas, were made in a number of cities throughout the State.

After sufficient progress had been made in different lines of investigation to reflect the general situation in the State, a conference of representatives of gas and electric companies was called for the purpose of arriving at a better understanding of the problems involved in the establishment of standards for gas and electric service. This conference, as previously reported in these columns, was held at Madison, March 3, and was attended by about 200 representatives of gas and electric companies, as well as by other experts from different parts of the country.

From the results of this conference a set of rules and regulations was formulated, which are now published for the guidance of the managements of the various electric companies in Wisconsin. It is recognized by the commission that certain plants are operated under conditions which make it impracticable or not to the best interests of the public to meet all the requirements of all the rules. In such cases the commission may modify the rules if the evidence in the case warrants it.

The rules and regulations adopted by the commission in reference to electric service are of such a character as to insure adequate service to the majority of consumers with the fewest number of restrictions. It was recognized that the rapidly changing conditions to which the electrical energy supply industry is subjected would make it impracticable to formulate rules at this time which might interfere with the natural growth or progress of the industry.

Adequacy of electric service may be considered under the following classifications: (1) Accuracy of meters; (2) regulation of pressure, and (3) efficiency of devices for utilizing electrical energy.

A meter is considered accurate if it does not register on no-load, and if the error is not in excess of 4 per cent. on light load, half load or full load. The commission requires that each central station shall make periodic tests on its meters, according to such methods as the commission shall approve. Each company is required to maintain a record of time, duration and cause of all interruptions of service upon its entire system or major divisions of its system. Also each company "shall adopt and maintain a standard average value of voltage as measured at any consumer's cut-out, which shall remain constant from day to day, and vary during any day by an amount not more than 6 per cent. of the minimum value."

A 6 per cent. variation is rather excessive and it is probable that a closer regulation will be required in the future. Under the changing conditions at present it appears that a rigid enforcement of this requirement will result in a marked improvement in the quality of service which has hitherto been furnished by the majority of companies in the State.

As has been amply verified by the inspectors on the engineering staff of the commission, much of unsatisfactory electric service comes from neglect on the part of the electric company or from lack of information on the part of the consumer as to some of the characteristics and practical limitations of electric lighting. The foregoing rules will help to remedy the former, while as regards the latter the commission has decreed that, "Each company supplying electrical energy for incandescent illumination shall adopt and maintain some method which will insure periodic inspection of incandescent lamps to which current is supplied, and under which the company will render its consumers assistance in securing incandescent lamps best adapted to the operation of the system. Each company shall submit to the commission the details of such method of procedure as it may adopt." Also, "Each company shall specifically inform each of its consumers as to the conditions under which efficient illuminating service may be secured from its system." As the progress of the art advances many changes and modifications of the definitions of adequate service and of the ru es for obtaining the same will undoubtedly be necessary.

Upon an investigation of the Hudson Water Works by the commission it was found that the above concern had ordered every consumer to buy or rent an "Empire" meter. Also that in certain cases consumers who owned "Niagara" meters were ordered to replace them by "Empire" meters or suffer the penalty of having their water turned off. It was brought out at the hearing that the "Niagara" meters were acknowledged by the water board of Hudson to be equal in point of service to the "Empire" meters. The city charged its patrons $1.50 per month rental and charged $11.60 for the "Empire" meter, while the "Niagara" meter could be bought for $7.10.

The point at issue was as to whether the water board had the right to compel a consumer to purchase and install a type of meter acceptable to it and to it alone. According to one section of the public utilities law, "It shall be unlawful for any public utility to demand, charge, collect or receive from any person, firm or corporation less compensation for any service rendered or to be rendered by said public utility in consideration of the furnishing by said person, firm or corporation of any part of the facilities incident thereto; provided nothing herein shall be construed as prohibiting any public utility from renting any facilities incident to the production, transmission, delivery or furnishing of heat, light, water or power or the conveyance of telephone messages and paying a reasonable rental therefor." This section of the law has come up many times in connection with telephone companies and it applies equally well to electric companies and all other public utilities. Under this law a city or corporation cannot give a lower rate to a consumer who owns his meter than to

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another consumer whose meter is owned by the city or corporation. The law contemplates that the divided ownership of parts of the equipment of public utilities shall cease, and that all responsibility for the installation and maintenance of the whole of the equipment shall be centered exclusively in the management. This means that private and municipal plants must acquire by purchase or lease all meters used in connection with their respective works. No utility can compel a consumer to acquire by purchase or lease a meter or any other part of the facilities which the utility is expected to furnish. Consequently it was held that the city of Hudson had no right to compel a consumer to use any kind of a meter, much less a particular type of meter.

On March 24 a hearing was held before the commission to consider the application of the Stoughton Electric Light and Power Company for authority to increase rates. The Company desired a more flexible rate which would enable it to sell more power to factories and large current consumers. The commission made a careful examination of the companies' earnings and expenses in order to determine the unit costs as a basis for rates. Although this is a municipal plant, the commission held that the expenses should be increased by tax, depreciation and interest charges in order to arrive at a reasonably safe basis for rates, although taxes and interest charges may, in a sense, be dispensed with in municipal plants. The commission granted the company authority to increase its rates.

The village of Cashton petitioned the commission for the determination of a just compensation to be paid to the Cashton Light and Power Company by said village, for the purchase of the companies' property actually used and useful for the convenience of the public. The Cashton Light and Power Company operated a pumping plant and flour mill in conjunction with the lighting plant, and it was evident from the testimony that the electric plant, as an independent enterprise, could not be conducted profitably, even if the most rigid economy were practised. In fixing the compensation to be paid the company, the following were some of the points brought out by the commission:

(1) "That in placing a value upon the physical property of a plant, the units of a plant should not be valued as independent entities, but as units of a going concern performing public utility service.

(2) "That while the law imposes upon the municipality the obligation of purchasing only such property as is both actually used and useful for the convenience of the public, nevertheless just compensation must be provided for any articles of property which, although not of any use to the municipality, would be lessened in value by the removal of the lighting system.

(3) "That the element of 'going value' created by the investments made in developing the business and in addition to the cost of the physical structure, must be taken into consideration in fixing value; that, although the franchise of a public utility operating under an indeterminate permit has expired upon the exercise by the municipality of its option to purchase, the plant is to be taken over as a going concern, and just compensation must be awarded for the property taken as a living and operating entity, engaged in serving the public, and not as a mere plant without patrons and without privilege or right to operate and to serve the public, and having but a salvage value."

The compensation fixed by the commission was based largely upon the above facts.

A hearing upon a petition signed by citizens and telephone subscribers of Black Earth, Wis., alleging inadequate service on the part of the Black Earth and Mazomanie telephone companies was held at the office of the commission on May 15. The petition alleges that the toll service between the two cities is very unsatisfactory, the overloading of the present circuit causing great inconvenience and often financial loss to business men from their failure to receive prompt service. The petition further alleges that the Black Earth telephone company has expressed its willingness to construct its share of an additional line, but that the Mazomanie telephone company had refused to co-operate in the same manner. It was stated at the hearing by the manager of Mazomanie company, that the present pole line was not strong enough to carry the additional circuit, and that an entirely new pole line would have to be constructed. After investigating the matter the commission issued an order commanding the two companies to construct an additional telephone circuit to connect the two exchanges, the same to be done within a period of 30 days.

In the case of Fullmer vs. Wausaw Street Railway Company the complainant alleged unjust discrimination in the arrangement of fare zones and excessive rates of fare. The petitioner conducts a pleasure resort a short distance outside the city, and the fare charged by the respondent company was 10 cents per trip. This was also the fare charged to the pavilion - a resort owned by the company—although the pavilion was nearly two miles further along the line. The petitioner testified that before the pavilion was operated, his place of business had been very popular, but that now, on account of extensive advertising and low transportation charges, the crowd had been diverted from his pleasure resort to the company's pavilion. It was brought out at the hearing that the published rates of the company called for a 15-cent round trip fare to either of the resorts. But the company's tariff rates also specify that the 15-cent rate to the company's pavilion includes a skating privilege. Thus, while the nominal rate of 15 cents applies also to the petitioner's place of business, the company is in reality paying a rebate in the shape of a skating privilege—worth probably 5 cents—at its own amusement park.

The commission recognizes the fact that the fusion of commercial and transportation enterprises is fraught with grave dangers, and that it is highly desirable to divorce the railway business absolutely from all pursuits in the domain of competitive industry and to confine itself exclusively to the primary function of transportation. With this end in view and after a careful examination of the company's receipts and expenditures, the commission ordered that the Wausaw Street Railway Company shall not charge more than 5 cents per trip between any two points on its line. It was further ordered that the company shall cease from publishing any tariff and collecting fares, either single or round trip, which included the charge for the admission of the holder of the ticket to the company's pavilion or other amusement resort operated by it. It is not the policy of the commission to discourage investments in public utilities and if it is evident at the end of 6 months that the above 5-cent rate will not return a reasonable amount upon the investment, the commission will entertain a request for an increase in rates, provided it can be shown that the above rate is actually too low.

Items of Interest
FROM VARIOUS LOCALITIES.

THE regular quarterly dividend of 1½ per cent. on the capital stock of the American Gas and Electric Company has been declared. It is payable to-day.

IT is said that the handsome way in Milwaukee, Wis., known as the Twenty-seventh street viaduct, will be lighted by means of high power gas lamps.

"ABOUT 200 signatures of the taxpayers of Monrovia, Cal., had, up to the 17th ult., been obtained to a petition urging the City Council to issue $50,000 in bonds, the proceeds of such issue to be devoted to the construction of a gas plant, to be operated on municipal account. This action was caused by the dissatisfaction which exists respecting the gas service here, which service is under the direction of the Edison Electric Company. The rate charged is $1.50 per 1,000, and the Company seems bent on driving customers away by pursuing anything other than a conciliatory policy. The rate is certainly high enough to warrant a much better service.—L. A."

"L. M. R." writing from Baltimore, Md., under date of July 24th, says: "I failed to see anything in the JOURNAL respecting a visit made here last week by certain athletes from Philadelphia, who are said to represent the best baseball playing talent procurable from the lists of the U. G. I. Company. As I said, they visited us last week, and they also returned to Philadelphia, chastened and quiet—but, more or less, athletes still. However, we did what we could to assuage their woe, after the game was over, after the gamesters had gone, by serving them up a very enjoyable dinner at the Y. M. C. A. The score was: Consol. G. and E. Co.'s team, 10; U. G. I. Co.'s team, 1. Some say that many of the local team's runs were butted in by our Locust Point mascot, whose whiskers we are bound to say will at least equal those of any other goat in America."

JUDGE MUNGER has handed down his opinion in the case of the Farmers Loan and Trust Company against the City Gas Company, of Beatrice, Neb. The opinion holds that as the city of Beatrice has an unsatisfied claim for $966 in taxes, which claim is a first lien on the property, the receiver shall forthwith advertise the property for sale unless other provision is immediately made to liquidate the indebtedness.

MR. H. B. HERYFORD has resigned the position of local manager of the Colusa (Cal.) Gas and Electric Company to accept the post of manager to the Chico (Cal.) Company. His successor at Colusa is Mr. Wm. Henderson, of Sacramento. The vacancy in the office staff of the San Jose Company has been filled by the appointment of Mr. Jno. D. Koster. The latter vacancy was occasioned by the death of Mr. H. J. Edwards.

AT the annual meeting of the Easthampton (Mass.) Company a resolution increasing the Directorate from 5 to 11 members was adopted, and these gentlemen were then elected to the Board: C. W. Hazelton, H. S. Thompson, F. A. Eustis, P. Cabot, P. H. Lombard, F. E. Frothingham, C. F. Deuel, J. N. Lyman, C. H. Johnson and H. L. Clark. The Directors then elected Mr. C. W. Hazelton as Clerk and Treasurer, and Mr. David Barry was chosen Manager, vice G. L. Manchester. The latter, to the writer's knowledge, has been Treasurer and Superintendent of the Company for 20 years or more. The usual semi-annual dividend of 3 per cent. was declared.

THE reorganization of the gas supply of Suffolk, Va., has been accomplished through the establishing of the Suffolk Gas-Electric Com-

pany, with a capital of $50,000. Its officers are: President, W. H. Venable; Vice-President, W. W. Starke; Secretary and Treasurer, M. G. Mulvey.

THE payment by the Kansas City (Mo.) Gas Company, on royalty account for the first half of the current year amounted to $23,460.59. Last year the payment on like account was $20,069.

MR. B. JONES, Manager of the electrical division of the properties of the Union Gas and Electric Company, of Cincinnati, leaves that service the 14th inst., to become General Manager of the Ohio Electric Railway Company.

NOW that the Public Service Commission for the Second New York District has sanctioned the bond issue asked for by Mr. W. T. Morris and associates, their several gas and electric properties are to be enlarged and otherwise improved. Possibly the first of them to be overhauled will be that at Norwich, N. Y. The betterments on the gas division will include new purifying and condensing apparatus, and an exhauster. The scheme of betterment includes the placing of 3 to 4 miles of additional mains and coal storage sheds. Altogether General Superintendant Summers will not have much leisure time on his hands the coming fall.

JUST before leaving for Youngstown, O., which is hereafter to be the field of business activity for Mr. F. A. Schroeder, former Superintendent of the gas plant in Spencer, Mass., that gentleman was called upon by a delegation of the employees of the Spencer Gas Company. Mr. Henry Gaut, on behalf of the visitors (the center of the operations was the Hotel Massasoit), acting for the delegates, presented Mr. Schroeder with a travelling bag, and also wishing him all success in his new business venture. Mr. Schroeder was a bit nonplused over the speech and the act, but speedily recovered his self-possession by a pleasing acknowledgement of the gift and the good fellowship that prompted it.

THAT the trading of the Newburyport (Mass.) Gas Light Company has increased largely is shown in the fact that, something over a fortnight ago, it placed an order for a two-lift holder with the Bartlett-Hayward Co., rated to hold 100,000 cubic feet.

THE silent, thoughtful gentleman who presides with such sincerity and success over the fortunes of the Peoples Gas Light Company, of Manchester, N. H., is overseeing the construction of a 3-lift holder in South Manchester, rated to retain 750,000 cubic feet. The vessel is to rest in a steel tank, and its sections are 36 feet in height, the diameters being, on the average, 110 feet. Surely this will lighten the load on Agent Africa's mind this coming winter season, for, truth to tell, he had many uneasy moments last winter when the demand for gas was at high water mark in that busy New Hampshire hive.

THE negotiations between the authorities of Wilkes-Barre, Pa., and the Wilkes-Barre Gas and Electric Company, looking to the public lighting of that place for a term of 7 years, have been satisfactorily concluded.

AT the annual meeting of the stockholders in the Nashua (N. H.) Light, Heat and Power Company the Directors elected were: F. W. Estabrook, F. E. Anderson, James H. Tolles, George E. Anderson and Elbert Wheeler; and the Directors subsequently named the following executive officers: President, F. W. Estabrook; Clerk, James H. Tolles; Treasurer, Elbert Wheeler; Superintendent, electrical division, Geo. L. Sadler; Superintendent, gas division, Walter F. Norton. The reports submitted by the management showed that the business of the Company was large and renumerative. The usual dividend was declared.

MR. GEORGE M. GADDIS, General Superintendent of the Great Falls (Mont.) Gas Company, the plant of which is now in course of erection, declares that gas will be turned into the mains not later than the end of October. The initial main system will figure up 6 miles.

AT the annual meeting of the shareholders in the Municipal Gas Company, Albany, N. Y., the officers elected were: Directors, A. N. Brady, Robert C. Pruyn, H. G. Young, John Bowe, John A. Delahanty, E. B. Cantine and James B. McEwan; Inspectors of Election, J. W. Cox, H. N. Lipman and George T. Kelly.

MESSRS. A. N. WALKER, of Scranton, Pa., and J. H. Haggerty, of Americus, Ga., recently visited Tuscaloosa, Ala., with a view to critically inspecting the named place as a likely one wherein to operate as a combined gas, electric light and power plant.

THE Gas Bench Construction Company has recently entered on its books orders for benchwork at Petersburg, Va., Chickasha, Okla., Lockport, N. Y., and Ottumwa, Ia.

W. A. BARNES, writing from Albany, N. Y., under date of July 22, incloses the following clipping from a newspaper in that city: "The Troy (N. Y.) Gas Company is betwixt the devil and the deep sea, as one result of the destruction by fire of the bridge that formerly led to the village of Waterford—which event happened last week. The gas supply of Waterford is carried on by the Troy Gas Company, and the current is plentifully used there for lighting account, both public and private, and for cooking and power purposes. As the main which carried the gas went out and down with the destruction of the bridge, the people have been without gas for several 24 hour periods, and the cries for it are plenty and pronounced. All of which goes to show that the people of Waterford now know how greatly gas goes for the making of public good The Troy Company, however, has not in any sense been 'on the wing' in the matter of restoring the supply, and the Village Trustees, aroused to action by the public clamor, have notified the Company that, unless it has gas in Waterford by 10 days (period is up August 2), the Public Service Commission will be appealed to. The thought just came to me now, 'How would Mr. Searle, of Rochester, N. Y., have acted under similar circumstances?' And I almost hear your reply: 'How soon? Well, 'Bob' would have that job finished (perhaps only temporarily) in 24 hours, or less.'" And so he would.

IN order to help along the project which is underway in Clinton, Mass., to have one public concert in that city each week during the next two months, the Company has agreed to supply all electric current necessary for the illumination of the band stands and surroundings without asking any charge therefor.

SECRETARY W. B. CARSON has notified the shareholders of the Consolidated Gas Company, of Pittsburgh, Pa., that their annual meeting is set for 2 P. M. to-day.

THE Harrisburg (Pa.) Company has agreed to extend its main system to and through the adjoining suburb of Camp Hill. The Company agrees to charge not in excess of $1.25 per 1,000 gross, or $1.15 net, and will furnish 5,000 cubic feet of gas free, each month, to the Borough for whatever use its Councilmen see fit to put it.

JUST prior to his departure for Tacoma, Wash., to which city he goes to assume the management of the Tacoma Gas Company's lighting properties, Mr. H. H. Hyde was presented by the attaches of the office of the Racine (Wis.) Gas Light Company with a beautiful silver salver suitably inscribed.

DURING the year ended June 30, 1909, the Boston Consolidated Gas Company sent out 4,254,338,000 cubic feet of gas, which shows a 5.15 per cent. gain over the sendout for the corresponding past twelvemonth.

A CORRESPONDENT informs us that the last week in July notices were being sent out from the offices of the Williamstown (Mass.) Gas Company announcing a reduction in the gross selling rate to $1.50 per 1,000. Prompt payment—within 10 days—entitles the user to a rebate of 10 cents per 1,000. The announcements, however, are not all of a joyous nature, in that it was also prescribed that a meter charge of 50 cents per month would come into play in all instances where it was shown that less than 400 cubic feet of gas had been used in the month. The further rule was also established that, in the instance of an electrical supply, accounts showing the use of less than 8 kilowatts of current per month would be billed at $1.

THE proprietors of the Leominster (Mass.) Gas Company are arranging to extend the distributing mains to and through the settlement of Whalom.

MISS EMMA WINSLOW, of Boston, recently concluded a very successful series of lecture-demonstrations on the use of gas for cooking in the plants controlled by the Worcester County (Mass.) Gas Company.

THE Donegal Gas Company, which distributes artificial gas to the residents of Mount Joy, Pa., is adding largely to its generating plant.

WE underetand that the Superintendent of Lamps and Lighting, Baltimore, Md. (Mr. McCuen), has fitted up the necessary plant for the testing of electric lighting current meters, which tests were made obligatory through an ordinance of Councils specifying how, when and where such tests were to be made and conducted. The main points in the measure closely resemble those on which the testing of gas meters are based.

The Market for Gas Securities.

The midsummer dull season is surely with us and share offerings have been on the slow and small order. However, in respect of gas shares the quotations keep up to the top of strength. Now that the tariff business is virtually settled, that money is acting soberly—that is, no sense of tightness is displayed respecting it—and that investors are on the wing, it is quite time that things were doing.

Keep your visual organs on Consolidated, in which some unusual (that is, unusual of late) changes in quotations are about to occur. We would experience no surprise if 175 were made in it by September 1st.

The general par share maket is strong, particularly in respect of accredited bond issues.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

AUGUST 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated Gas Co.	$78,177,000	100	140⅝	140¾
Central Union Gas Co.—				
1st 5's, due 1928, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,500,000	100	155	165
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	140¼	143
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91⅛	92
Yonkers	200,000	500	130	—
Out-of Town Companies.				
Bay State	50,000,000	50	¾	⅞
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	90	95
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73½
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,000,000	1,000	104	105½
Cincinnati Gas and Electric Co.	29,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,028,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,000,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	—
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	103	103½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis.	10,000,000	100	104	105
Preferred	2,500,000	100	—	98
Bonds	10,000,000	1,000	104	—
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	108½
" 6 per cent. scrip, due 1910	100,000	25	60	60¼
Massachusetts Gas Companies, of Boston	25,000,000	100	63¾	63
Preferred	25,000,000	100	90¾	91
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	114¼	114¾x
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105¼
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	2,600,000	20	377½	378½
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	230	—

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Position Wanted
As Superintendent,

By a competent gas man who has had practical experience in all branches of the business, both coal and water gas. At present employed. A-1 references.

1755-tf Address, "R. C.," care this Journal.

WANTED,
A Position as Foreman or Assistant to Superintendent,

By a married man, 30 years of age; sober and reliable. Seven years' experience in water gas works and distribution. Address, "NEW ENGLAND,"

1783-2 Care this Journal.

Position Wanted.

A married man, 31 years of age, with 9 years' experience in all branches of the gas business, wishes a position as superintendent or maaager of a small or medium size water gas company. Thoroughly experienced in getting results on large or small water gas sets, also new business. At present employed by one of the largest operating companies in the United States. Best of references furnisned.

1780-tf Address, "S. H. P.," care this Journal.

WANTED,
Position as Manager or Superintendent,

By an experienced and competent man. Coal or water gas. Best of references.

1781-2 Address, "BROAD," care this Journal.

Position Wanted.

Water gas maker wishes position in small plant as gas maker or foreman. Have had 3 years' experience and 2 months in coal gas making. Can repair own machinery. Address, "STATE,"

1782-1 Care this Journal.

POSITION WANTED AS MANAGER.

Twenty years' experience in construction, operation and management of coal and water gas plants. Last 12 years with present company and can give owners and any business or professional man in the city as reference to ability as a gas man. Up to date in every detail and new methods of pushing the business.

1782-3 Address, "A. Z.," care this Journal.

WANTED,

A Position as Superintendent of Gas Plant, Either coal or water gas. Understand the business thoroughly in all its branches. Can give the best of references.

1781-3 Address, "HUSTLER," care this Journal.

Position Wanted

By a Competent, Energetic and Reliable Gas Man,

Thirty-three years of age, married, strictly sober, and one who can show results. Good technical education, with 13 years of thorough practical experience in all departments of the gas business. Either coal, water or natural gas. At present employed as manager in a city of 36,000 inhabitants. Can furnish first-class references from present employers, as well as others, and willing to go anywhere. Address BOX No. 22,

1782 5 Care this Journal.

Position Wanted.
First-Class Repairer, Tester and Prover on Prepaid and Ordinary Gas Meters.

An all-round meter man, with a thorough knowledge of the routine work of a meter repair shop, desires to take charge of a repair shop with gas company in large or small city. A-1 references. Address, "SHOPMAN,"

17-2-1 Care this Journal.

Position Wanted
As a Water Gas Maker,

By a young man of 25 years of age. Married. Have had 10 years' practical experience. Can handle 1 or 2 machines. Now employed.

1782-1 Address, "GENERATOR," care this Journal.

WANTED,

For Western territory, an aggressive and competent traveling salesman for a leading line of gas ranges and heaters. State age and experience.

Address, "MANUFACTURER,"

1767-tf Care this Journal.

WANTED,
Retort House Foreman for 30,000,000 Coal Gas Plant.

Applicant should preferably, but not necessarily, have had water gas experience, and must be experienced in the handling of negro retort house labor. Wages, $75 per month to one who can show results. Address, "RETORT,"

1780-tf Care this Journal.

WANTED,
Working Foreman for Coal Gas Plant.

One thoroughly familiar with operation of same. Address, "GAS MAKING,"

1781-tf Care this Journal.

WANTED,
Works Foreman for Up-to-Date Water and Coal Gas Plant in Eastern City of 20,000.

Applicant must be able to keep up machinery, handle men and get results. State age, experience, salary expected and inclose references.

1782-2 Address, "SLADE," care this Journal.

WANTED AT ONCE.
Second-Hand Compressor, in Good Working Order.

One capable of handling 15,000 cu. ft. of gas per hour against 100 lbs. pressure. Full description, with lowest price, to

1780 3 BESSEMER GAS CO., Bessemer, Ala.

FOR SALE,

One set of 4 purifying boxes 12 feet 8 inches by 10 feet 9 inches by 3 feet, in good condition, with centerseal and 10-inch connections. Also one American 8-foot station meter.

1771 tf YORK GAS CO., York, Pa.

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Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

IMPROVED AMMONIA CONCENTRATOR.

About 100 in use. Write to

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WILLIAM A. BAEHR,

CONSULTING ENGINEER,

Commercial National Bank Building,

CHICAGO.

Also Representing

The Bartlett-Hayward Company.

Celebrated Lux Gas Purifying Mass

Will Save 50 Per Cent. Labor.

Used in the Gas Works of Berlin, Kiel, Frankfort, Vienna, Amsterdam, Antwerp, London, Edinburgh, Copenhagen, Madrid, Seville, Barcelona, Rio de Janeiro and others. :: :: ::

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54 Front St., New York.

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Consulting Engineers.

Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::

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Every Tool a Favorite.

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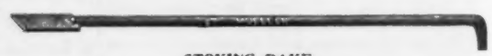
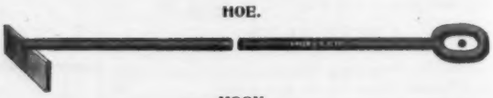
MOUTHPIECE BAR.



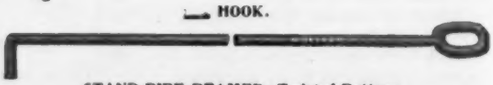
STOKING RAKE.

STAND PIPE AUGER.

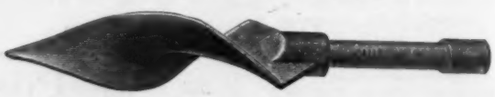
HOE.



HOOK.

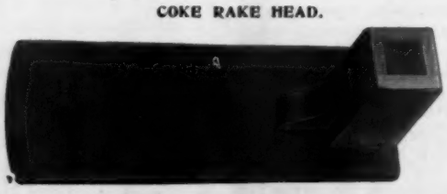


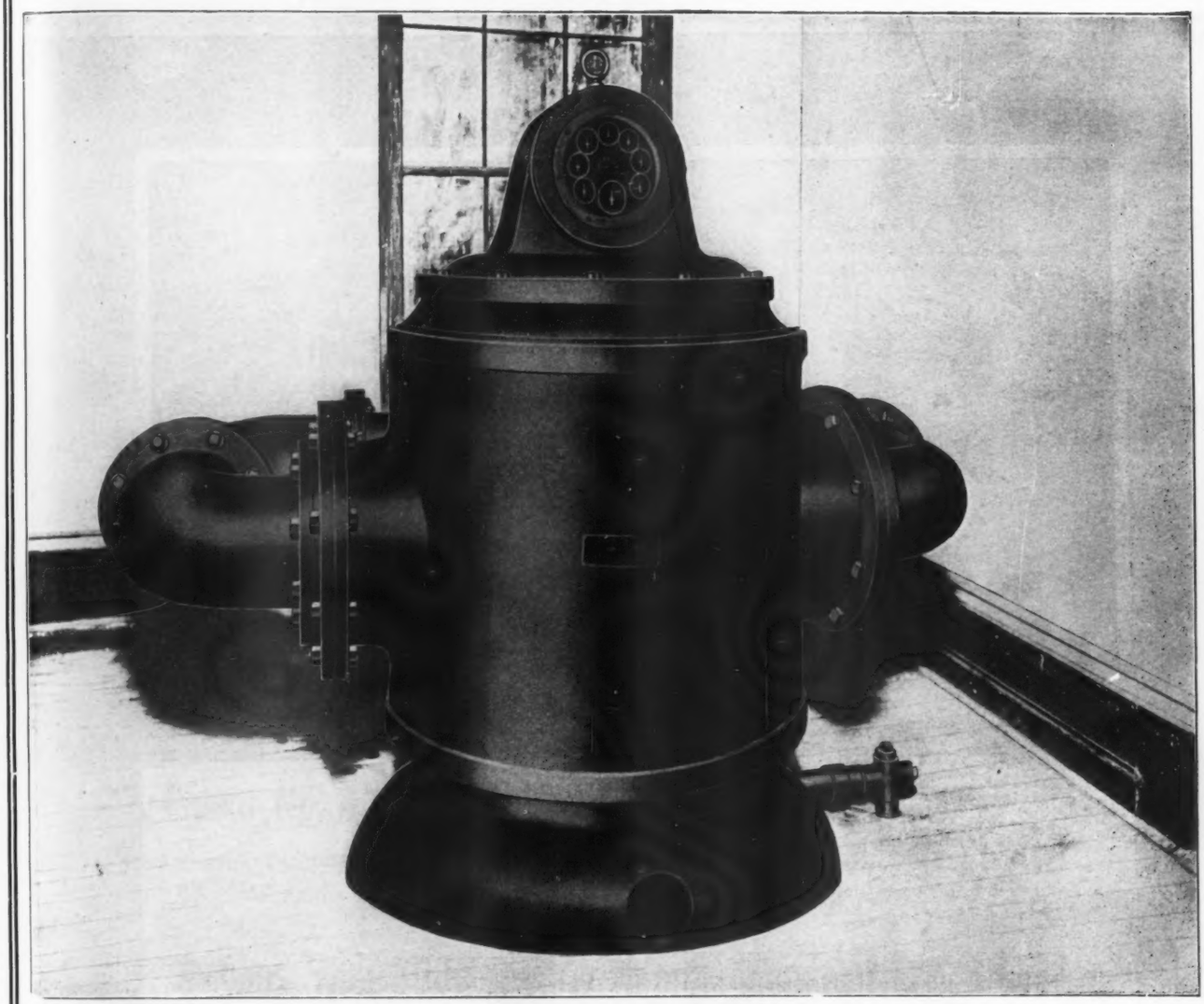
STAND PIPE REAMER—Twisted Pattern.



STAND PIPE REAMER—Powers' Pattern.

COKE RAKE HEAD.





Meter Room Austin (Tex.) Gas Light Co. Rotary Meter 30,000 cu. ft. per hour.

K. L. AMES, President and Treasurer

C. H. WHITELAW, Secretary

Austin Gas Light Company

H. M. MOORE, Manager

Austin, Texas, July 12, 1909

Rotary Meter Co.,
280 Broadway,
New York City.

Gentlemen:

We have had one of your Rotary Meters in use here since the first day of August, 1907, which has given us entire satisfaction, is accurate, and requires very slight attention. We prefer it to the old-fashioned wet meter.

Yours truly,

H. M. Moore
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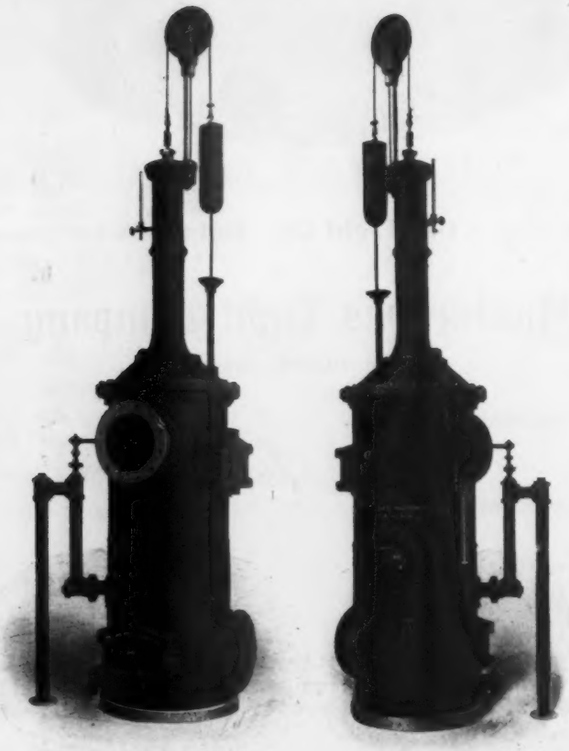

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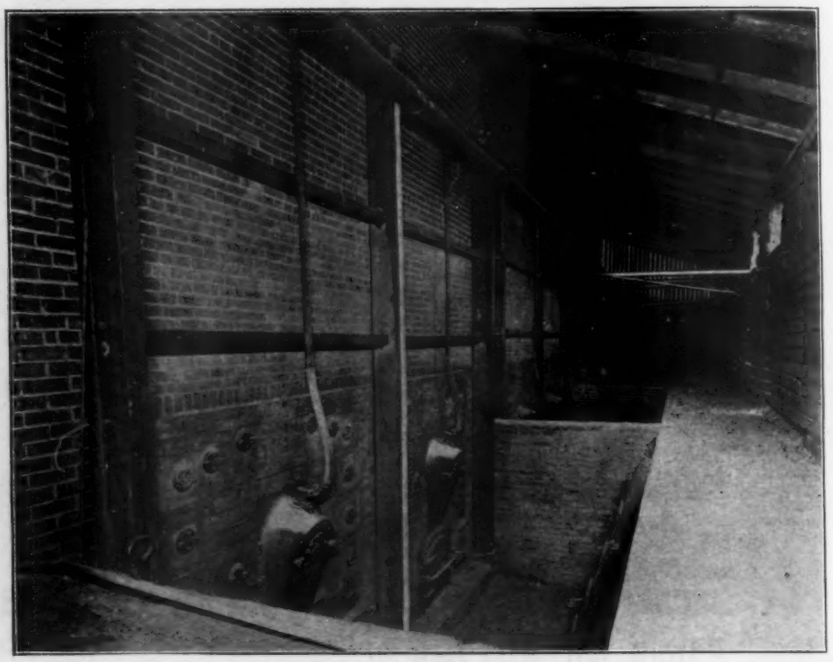

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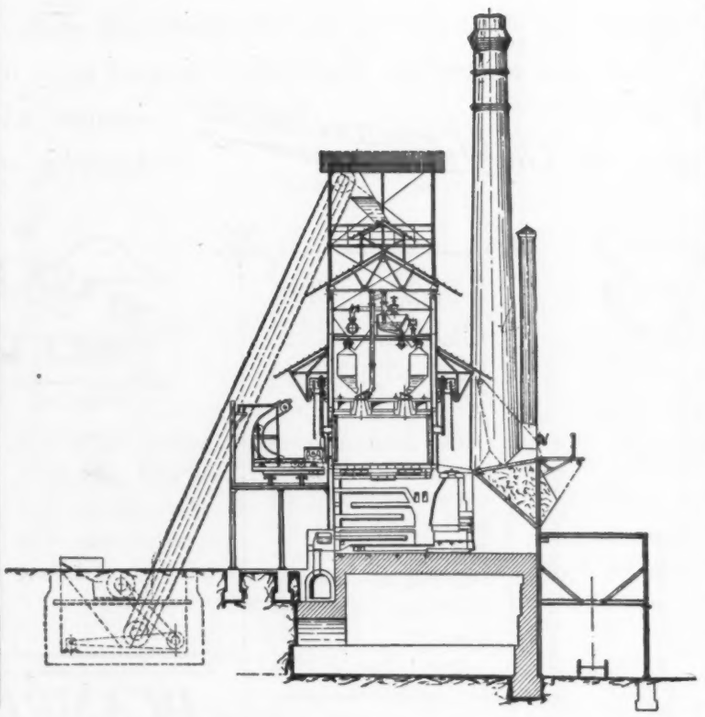

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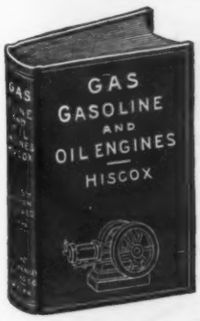

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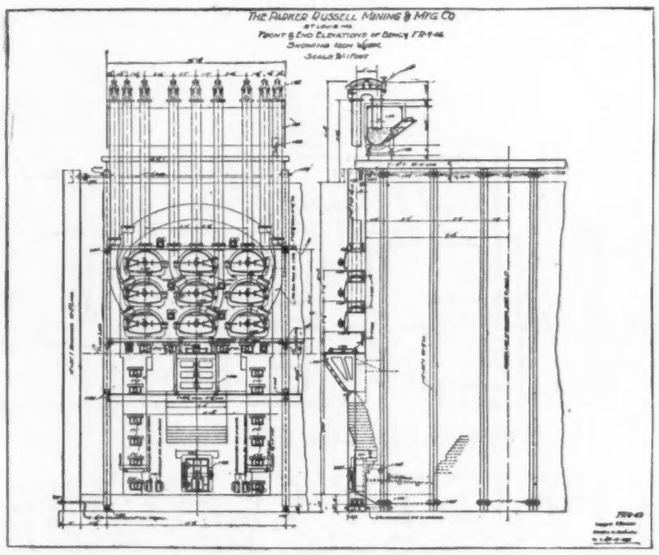

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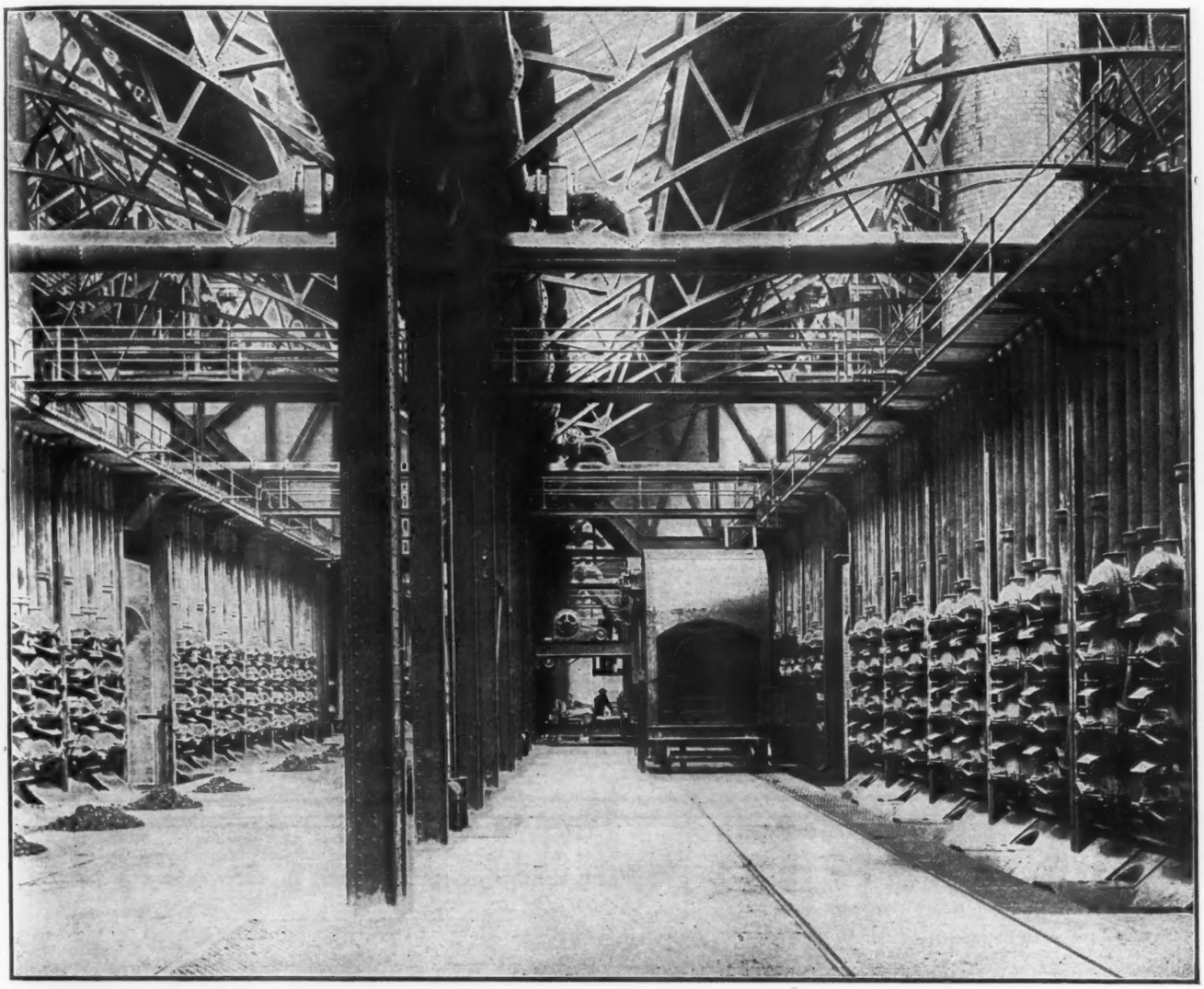

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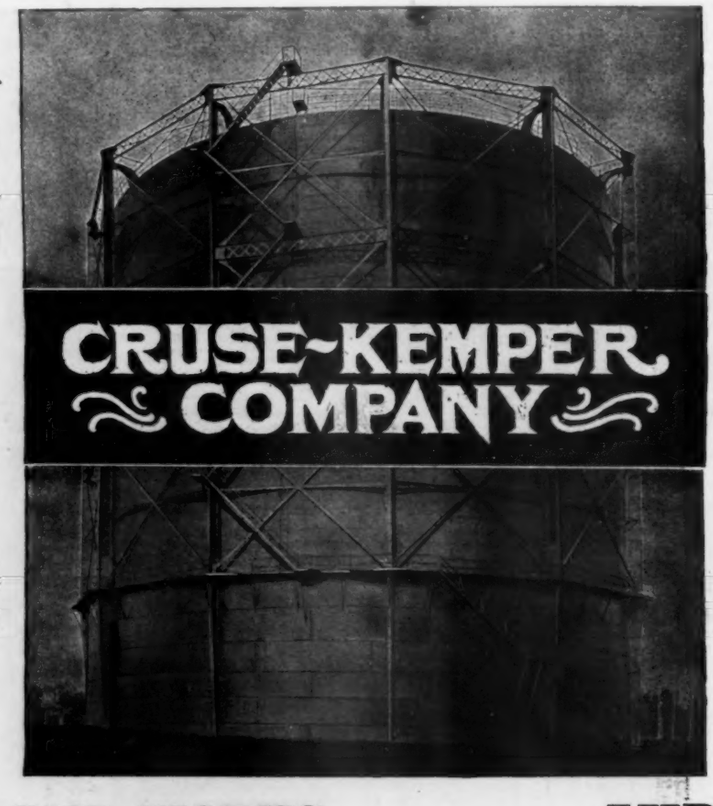

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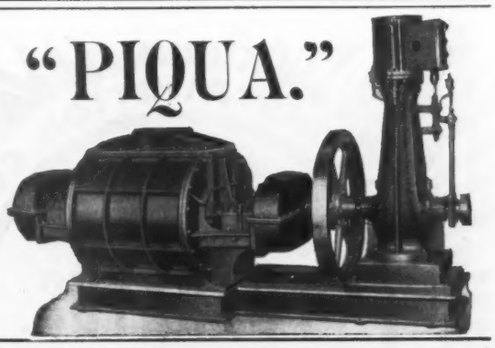

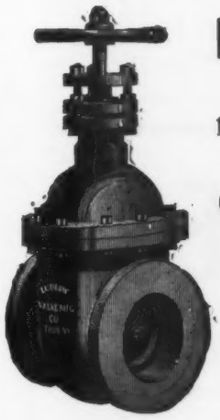

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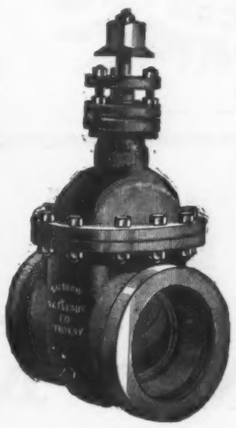

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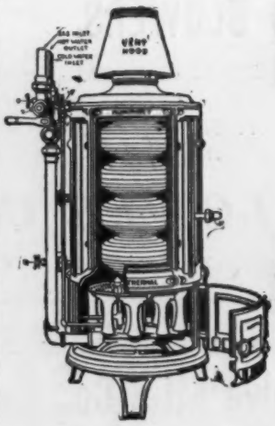

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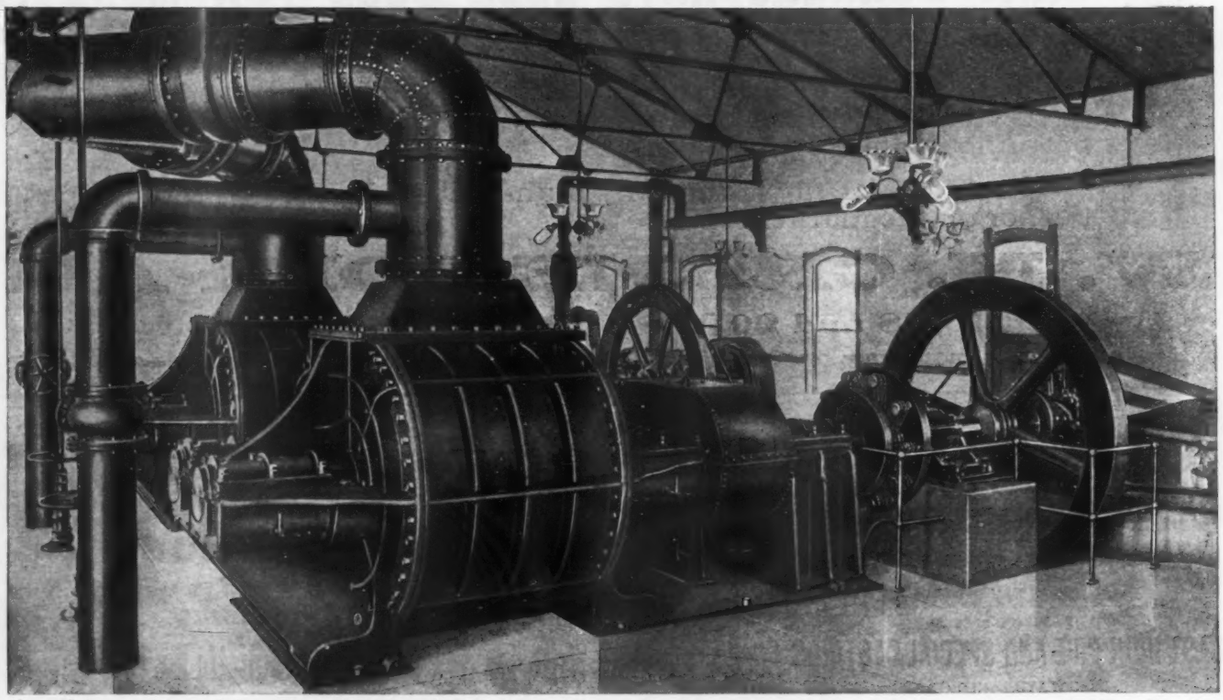

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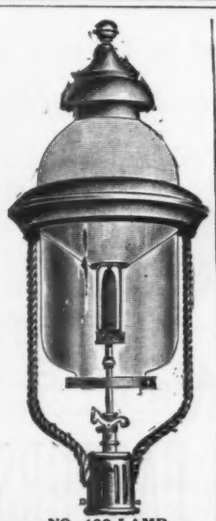

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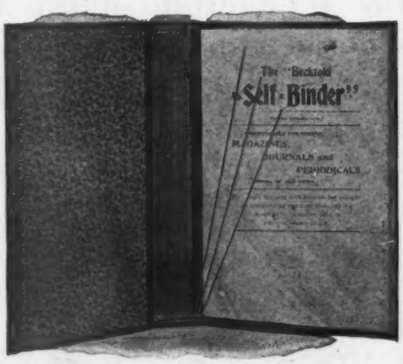

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

AUGUST, 1909.

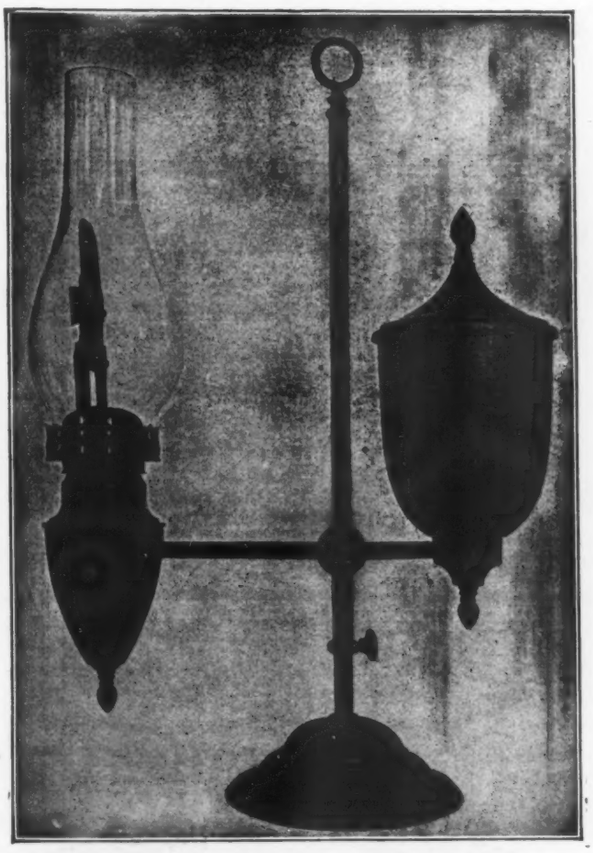
Table No. 1.
FOLLOWING THE MOON.

Day of Week.	Date.	Light.	Extinguish.
Sun.	1	No L FM	No L.
Mon.	2	No L.	No L.
Tue.	3	7.40PM	9.50PM
Wed.	4	7.40	10.20
Thu.	5	7.40	10.50
Fri.	6	7.40	11.20
Sat.	7	7.40	11.50
Sun.	8	7.30LQ	12.20AM
Mon.	9	7.30	1.00
Tue.	10	7.30	1.40
Wed.	11	7.30	2.30
Thu.	12	7.30	4.10
Fri.	13	7.30	4.10
Sat.	14	7.30	4.10
Sun.	15	7.20NM	4.10
Mon.	16	7.20	4.10
Tue.	17	7.20	4.10
Wed.	18	7.20	4.10
Thu.	19	7.20	4.10
Fri.	20	8.20	4.10
Sat.	21	8.40	4.10
Sun.	22	9.10	4.20
Mon.	23	9.40FQ	4.20
Tue.	24	10.10	4.20
Wed.	25	11.00	4.20
Thu.	26	11.50	4.20
Fri.	27	12.50AM	4.20
Sat.	28	2.00	4.20
Sun.	29	No L.	No L.
Mon.	30	No L.FM	No L.
Tue.	31	No L.	No L.

TOTAL HOURS DURING 1909.

By Table No. 1.

	Hrs.Min.
January	212.20
February	183.40
March	173.00
April	151.10
May	144.10
June	138.50
July	145.40
August	160.30
September	180.00
October	201.00
November	216.30
December	233.40
Total, yr.	2140.30



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10-Candle Power.

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This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

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2d. It is remarkably steady. Will burn 24 hours continuously with less than 2 per cent. variation.

3d. It is much less dangerous than Pentane, which is a kind of gasolene.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

AUGUST, 1909.

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Complete Lighting in One Hour	Complete Extinguishing in 50 Minutes
		From Time Given	
		P. M.	A. M.
Sun.	1	7.02	3.27
Mon.	2	7.02	3.27
Tue.	3	7.02	3.27
Wed.	4	7.02	3.27
Thu.	5	7.02	3.27
Fri.	6	6.57	3.37
Sat.	7	6.57	3.37
Sun.	8	6.57	3.37
Mon.	9	6.57	3.37
Tue.	10	6.57	3.37
Wed.	11	6.57	3.37
Thu.	12	6.57	3.37
Fri.	13	6.47	3.47
Sat.	14	6.47	3.47
Sun.	15	6.47	3.47
Mon.	16	6.47	3.47
Tue.	17	6.47	3.47
Wed.	18	6.47	3.47
Thu.	19	6.47	3.47
Fri.	20	6.37	3.52
Sat.	21	6.37	3.52
Sun.	22	6.37	3.52
Mon.	23	6.37	3.52
Tue.	24	6.37	3.52
Wed.	25	6.37	3.52
Thu.	26	6.37	3.52
Fri.	27	6.27	3.57
Sat.	28	6.27	3.57
Sun.	29	6.27	3.57
Mon.	30	6.27	3.57
Tue.	31	6.27	3.57

TOTAL HOURS DURING 1909.

	Hrs.Min.
January	428.30
February	358.15
March	353.10
April	298.10
May	263.20
June	234.45
July	248.30
August	278.00
September	311.25
October	370.05
November	397.40
December	438.35
	3980.25
Deduct on account of 50 min. extinguishing time	30.25
Total, yr.	3950.00

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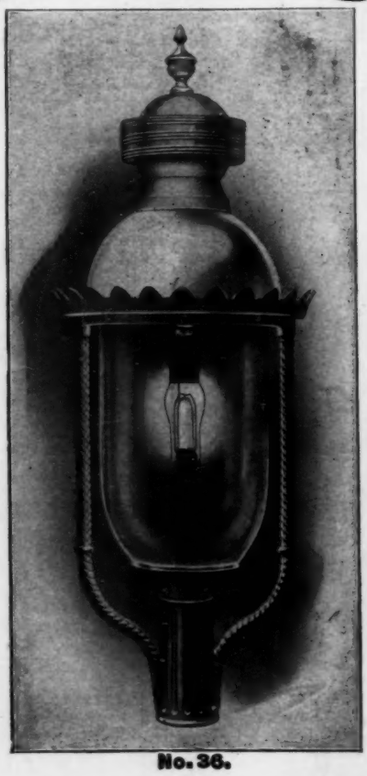
WELSBACH STREET LIGHTING COMPANY



No. 36.

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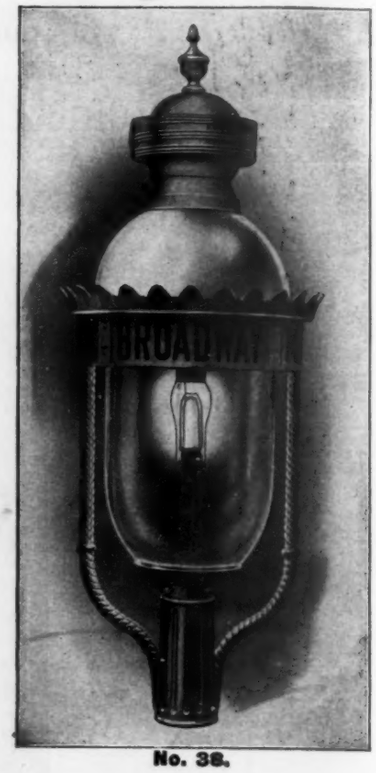

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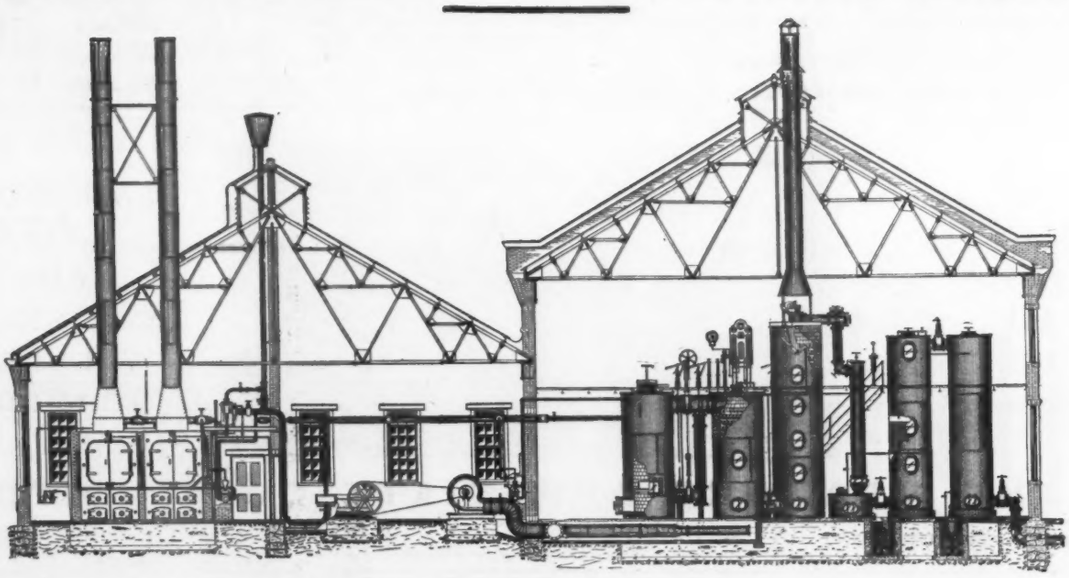

TOTAL SETS INSTALLED TO JULY 1, 1909, ... 704
TOTAL DAILY CAPACITY TO JULY 1, 1909, ... 577,440,000 cu. ft.

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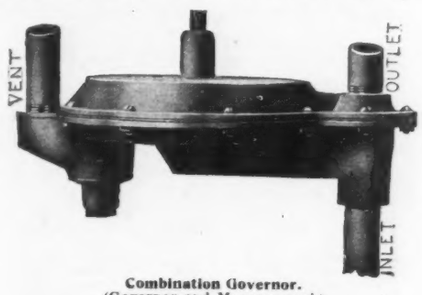

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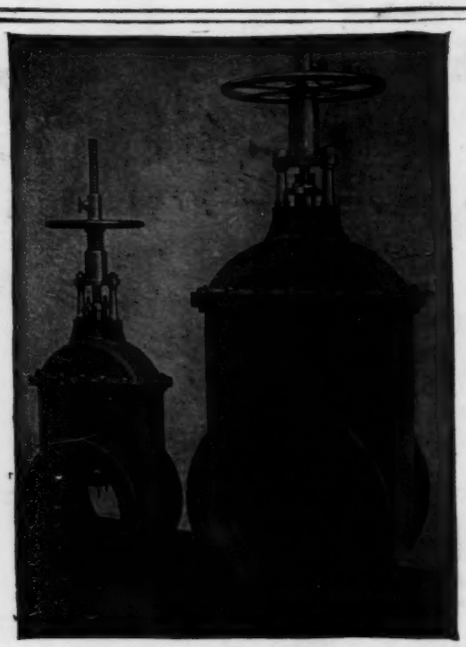

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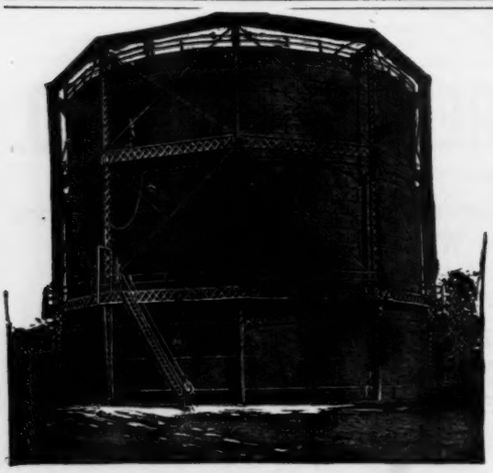

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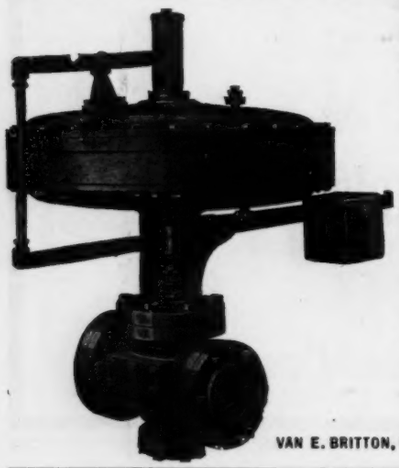

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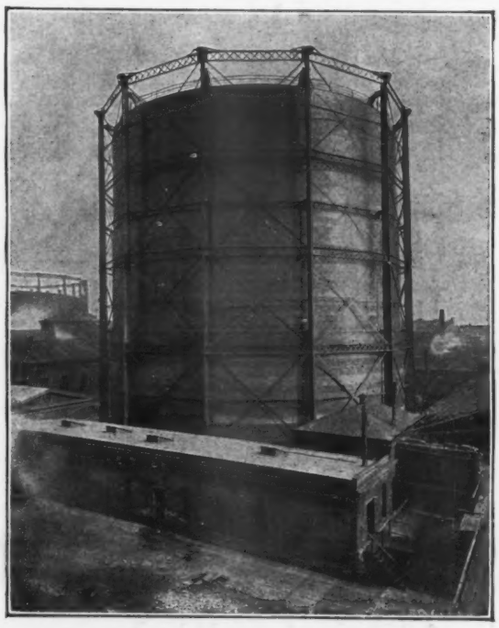

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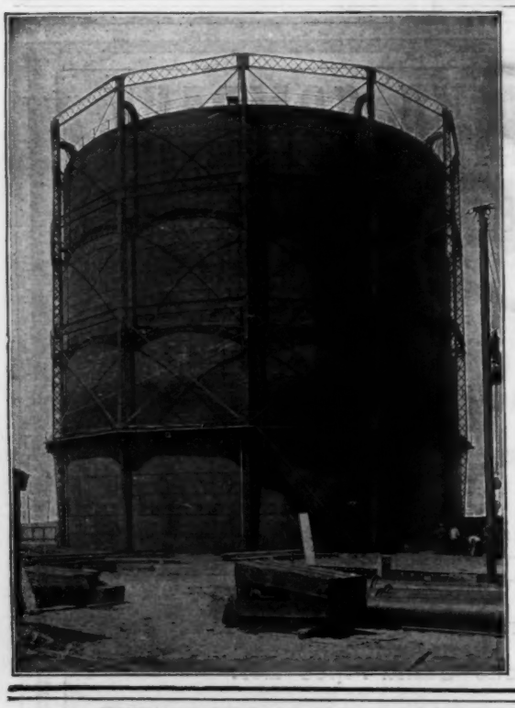

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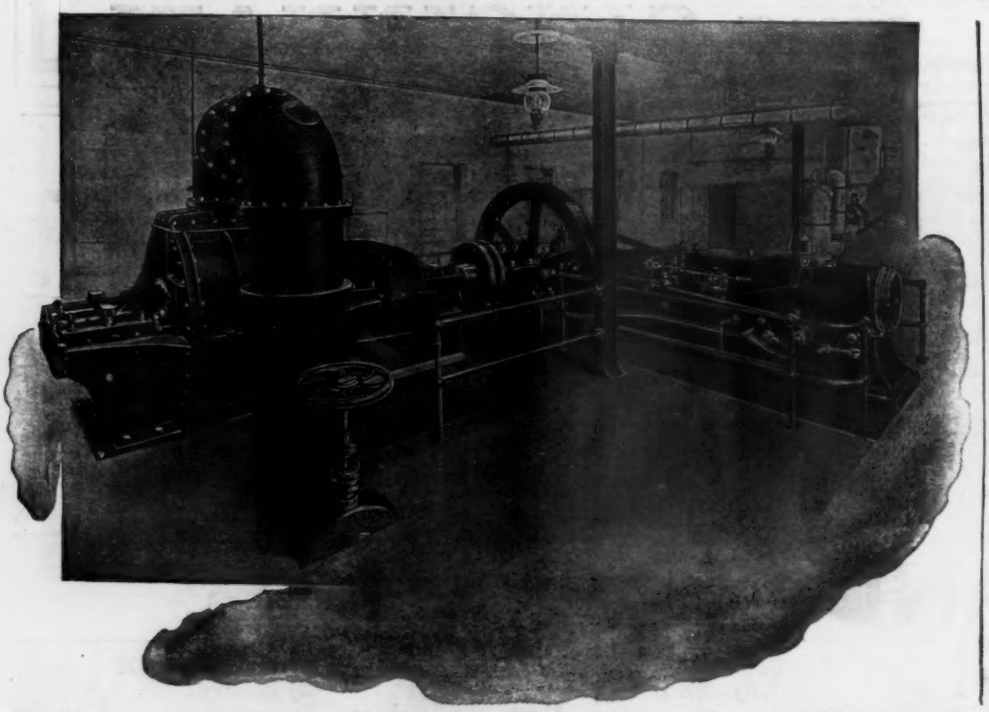

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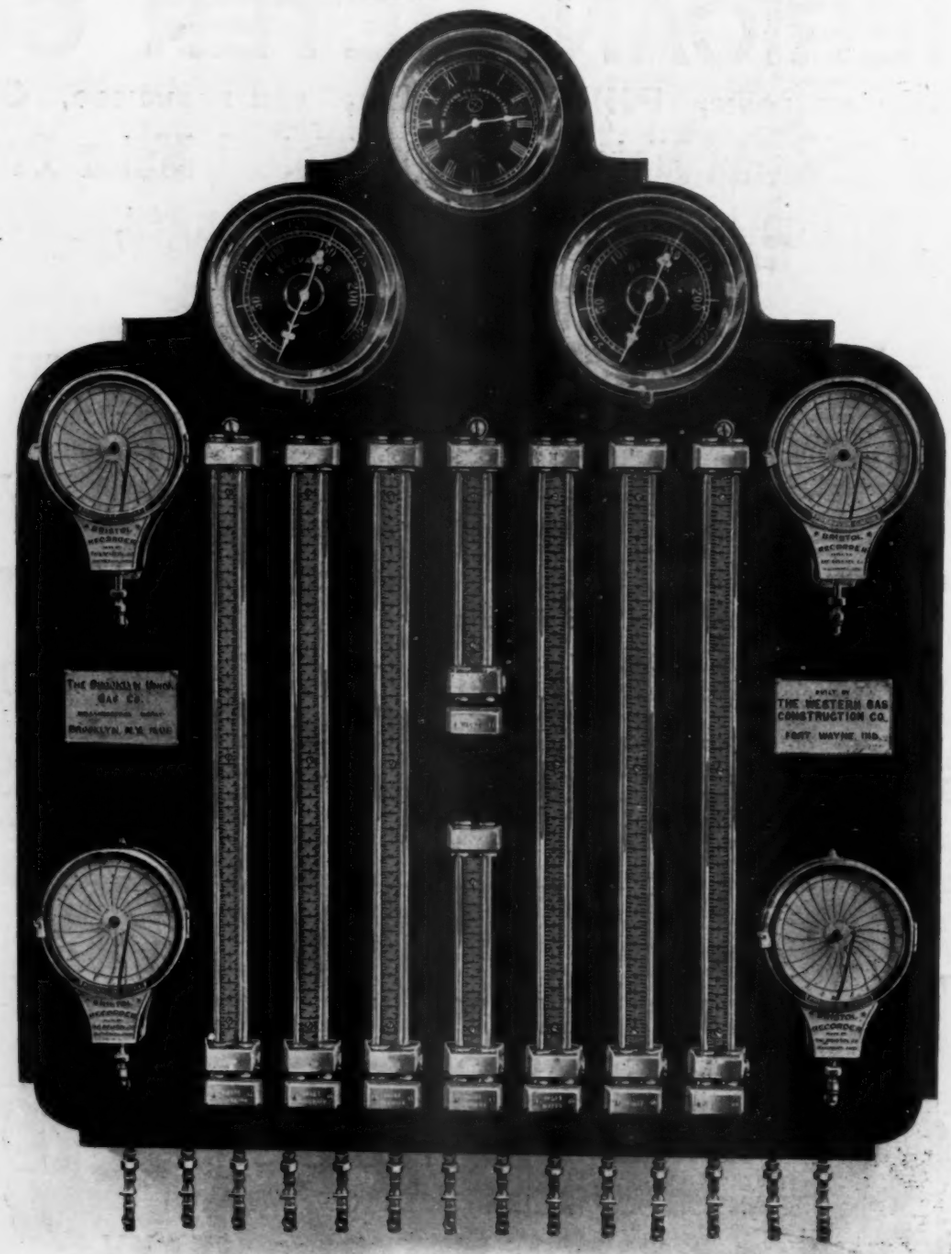

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